FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice, and Progress of Aerial Locomotion and Transport.

OFFICIAL ORGAN OF THE ROYAL AERO CLUB OF THE UNITED KINGDOM.

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Flight.

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CONTENTS.

EDITORIAL COMMENT.

A Sorry Comparison.

A production which is exceedingly well worth the careful perusal of every British patriot is the first annual report of the German National Flying Endowment. We confessedly do not care much for the word "patriot," but it must stand in this instance as indicating the person who really has that intelligent interest in the affairs of the nation, and that grasp of actualities and requirements, which enables him to exert some influence, no matter how slight, on the trend of passing events. To the apathetic the Report may have no significance, though we should very greatly like to be able to place a copy of the document in the hands of the uninterested majority—for we have only too much reason to fear that the majority *is* apathetic in matters affecting aerial defence—and leave it to do its missionary work.

Perusal of the work in question must create two distinct sets of impressions. The first will be one of admiration for the singleness of purpose and the intense patriotism of the Germans as a nation. The second, unfortunately, will be one of bitter regret that our own people remain so entirely untouched by the seriousness of the situation as it exists in all its naked actuality. It is not as though the facts had not been stated and restated with all the emphasis at the command of some of the ablest of contemporary writers. Time after time it has been pointed out in the public prints that we are lagging hopelessly behind other nations in the development of aviation, but the great mass of the public continues to regard things with the eye of apathy, even if it condescends to regard them at all. In vain have been all the appeals to England to wake up. In vain has money been spent by public spirited men in demonstrating the marvellous pitch of development to which the science of flight has attained. Still we seem content to drift, and even the thinking classes appear happy in the belief that when the time comes for the reckoning we shall, as we have always done, muddle through somehow. They might possibly admit that it is tempting Fate—but then we have so often tempted her, and yet in the end of things she has smiled kindly upon us.

Let us glance for a moment at some of the most salient facts disclosed by the German Report. The "National Flying Endowment" was instituted in 1912, as an answer to the French fund for the provision of aerial craft for the army. It received the active support of the Kaiser himself and of Prince Henry of Prussia, who both lent their names to an urgent appeal for money wherewith to develop aviation. The appeal was not for money to purchase aircraft for the Services—that matter was very properly left to the departments of State involved. On the contrary, the fund was to be one for development purposes alone. Within six months £360,000 had been subscribed—and this in addition to the memorable subscription of £300,000 collected to enable Count Zeppelin to continue his experiments with airships! Two years ago, the few German airmen were absolutely dependent upon France for their engines, and in great part for the actual machines into which the motors were to be fitted. To-day they are flying German machines with German engines—all as a result of the magnificent response made by a patriotic people to the appeal of the Kaiser and those identified with the Endowment. At the present moment nearly all the world's flying records that really matter are held by German aviators, flying German machines, propelled by German motors. According to the report, Germany now has no fewer than 650 licensed civilian pilots, in addition to military aviators, of whom there is no record given. There are forty-seven properly equipped aeroplane factories in Germany, many of them able to turn out more than a hundred machines a year; there are forty-three

aerodromes, or "landing places," as the Report describes them, with sheds for aeroplanes or airships, and twenty aerial "lighthouses." At the flying ground of Johannisthal, near Berlin, there were made 4,732 flights during the month of October last, as compared with 2,537 in the corresponding month of 1912. There were made 36,817 flights at Johannisthal during the year, representing a total of 4,096 flying hours, compared with 1,966 hours in 1912. And so we might go on almost *ad infinitum* in the detail of figures and increases disclosed by the Report.

How does the Endowment work? Let us quote from an article upon this same Report by the Berlin correspondent of the *Daily Mail*, who says:—

"The *Flugspende*, though nominally a private enterprise, is officially administered, having been made an adjunct of the Imperial Home Office. The colossal progress in German flying is due primarily to the Endowment's influence. There was tremendous significance in the recent announcement that as Germany now possessed the most important flying records, and a sum of £40,000 set aside as bonuses to German record-breakers was already exhausted, no more bonuses would be bestowed, and the Endowment's remaining funds would henceforth be devoted to more urgent purposes. £15,000 has been distributed between seven airmen for distance flights within twenty-four hours, including £5,000 to Herr Victor Stoeffler for the world's record of 1,350 miles, and £3,000 to Herr Schlegel, whose 935-mile non-stop flight outstrips M. Brindejonc des Moulinais's French record by seventy-two miles. Besides this the Endowment distributed another £25,000 in premiums. A reward of £50 was paid to every airman who made a non-stop flight of one hour, with £25 extra for every passenger carried overland. For every additional non-stop hour and passenger, another £50 and £25, respectively, were given. On the airman who established the German non-stop record of at least six hours a monthly bonus of £100 was bestowed, and to airmen who executed the longest cross-country flight of a minimum of 375 miles, including landings, within twenty-four hours, monthly bonuses of £200 were paid. Monthly bonuses could be claimed for a maximum of five months as long as the record-holder's achievements were not outstripped.

"Monthly premiums of £200 for the longest cross-country flight were awarded to seven airmen for flights ranging between 312½ and 1,350 miles. Six airmen received monthly awards of £100 for non-stop flights ranging from 6 hrs. 4 mins. to Bruno Langer's recent record of 14 hrs. 7 mins.

"In addition to encouraging and rewarding airmen, the Endowment has paid annual subsidies of £2,000 to numerous aeroplane factories which undertake to train five pilots a year. This not only facilitates the free education of pilots, but helps to put the flying-machine industry on a commercial footing. The endowment also maintains a system of free insurance benefits for airmen and for dependents of those killed or incapacitated in service. For bonuses, prizes, training of pilots, benefits, flying competitions, flying stations, scientific purposes, and sundry other forms of promotion, £85,000 was disbursed in 1913, leaving £275,000 in the Endowment's treasury. The budget for 1914 provides for £68,000 expenditure, including £15,000 for a long-distance competition, £5,000 for promotion of flying in the Colonies, £11,250 for a motor competition, £6,250 for a naval waterplane competition, and £12,500 for a waterplane station on the Baltic. It is stated that the German Army has at its disposal at least as many qualified "field pilots" as France. The number at the end of 1913, I think, was 650, which is shortly to be increased to a 1,000. The Army has twenty-two aeronautical stations, mostly near frontiers. The Navy had thirty-six waterplanes at the end of 1913. Tremendous enthusiasm for flying prevails in both services. Aeroplane factories and flying schools can hardly compete with the demand for tuition."

And while all this is going on in Germany, what are we doing to encourage development? We have not done so badly, considering the handicaps under which the industry labours. We certainly can claim that we have one or two aeronautical engines comparable to the best of the foreign motors, but in consequence of uncertain demand they are not being made in large numbers. Our machines will compare in design and air-worthiness with the best of those made abroad, but here again production is restricted by want of encouragement. On the other side of the picture, we have made no answer to the French fund, let alone to the German Endowment. What, for example, has become of the attempt to raise a paltry £50,000, through the Aerial League's "Million Shillings" fund. Whatever has become of it, the money was not raised, and that in spite of the imposing array of names of municipal and other authorities who were supposed to have lent their influence to it. The appeal fell on deaf ears—apparently the great mass of the public are so apathetic, so wanting in regard for the prestige and even the safety of the nation that they do not assess their stake in the country at the price of a shilling! It is a sad and a bitter reflection, but there it is. It really seems to us that nothing in the world will serve to awake this type of patriot (!) from his apathy but the realisation of all that is meant and implied by the German toast "*Am Tag*."

F. W. GOODDEN.

IT was about five years ago that F. W. Goodden, having spent three years at practical engineering, decided to become actively connected with aeronautical work. He joined Messrs. C. G. Spencer and Sons, the well-known balloonists, in 1908, and the following year made his first balloon ascent, then going on to parachute descents, giving exhibitions at most of the large towns in the Midlands and the North. This was followed by some experience with airships, and in October, 1910, Goodden left Spencers in order to assist in the construction of the Willows airship "City of Cardiff" at the Crystal Palace, and he was with Mr. Willows on the craft during its voyage to France on November 4th, 1910. Returning to England in the following January, Goodden settled at Oxford, and after a good deal of ballooning, including a number of parachute descents, decided to turn his attention to the heavier-than-air type of machine. On New Year's Day, 1912, he set to work to build a monoplane, and, although the only motor available was an old 35 h.p. J.A.P., some very good flying was done in the summer. The venture, unfortunately, had to come to an end owing to lack of funds, and in the following February Goodden joined the Caudron school at Hendon, where he has been since. His fine flying on the Caudron has been so frequently referred to in these pages that it is unnecessary to make any detailed reference to it. It will be seen that Goodden has had a most unique experience, such as probably no other pilot in this country, with the exception of Mr. Herbert Spencer, can claim.

THE HAWK.

The Slack Fund.

AMONG the latest donations received towards the fund being raised for the aid of the widow and children of the late Robert Slack are: Anonymous, £12 12*s.*; the Grahame-White Aviation Co., £10; the Aircraft Co., Mr. G. C. Gold, Mrs. Arthur Forman, £5 5*s.* each; Mrs. Wallace Stroud, £2; Messrs. Frank Sale, Ben. Suttley, L. A. Strange, A. V. Roe, A. B. Leakey, £1 1*s.* each; MM. P. Marty, Verrier, £1 each; Mr. J. H. Hall, 11*s.*; Messrs. C. J. Fairfax Scott, T.O.H.B., 10*s.* 6*d.* each.

Magneto Ignition for Beginners.

THERE is appearing in our contemporary the *Auto.* (Yellow Cover), an elementary explanation of magneto electricity and the action of a magneto, which may be of interest to those readers of FLIGHT who are not familiar with the why and wherefore of electrical phenomena, and yet are concerned with magneto ignition in practice. The dates upon which the articles appeared were February 7th, 14th and 21st, and these issues can be obtained from the Publishers, at 44, St. Martin's Lane, at 1½*d.* each, post free.

MEN OF MOMENT IN THE WORLD OF FLIGHT.

MR. F. W. GOODDEN.

TESTS FOR AEROPLANES OF PRIVATE DESIGN.

THE following *communique*, setting forth the tests which the War Office require aeroplanes of private design to pass before acceptance, was issued from the War Office on Wednesday last :—

1. The Chief Inspector of Military Aeronautics is prepared, on the request of an aeroplane constructor, to put an aeroplane through the ordinary military acceptance test under the following conditions:—

(i) The test consists of examination of workmanship and materials, speed test, fast and slow, climbing, weight of load carried, rolling test, and one hour's flight. The constructor must supply the pilot and passenger. For purposes of calculation weights of pilot and passenger will be 160 lbs. each.

(ii) Stress diagrams in duplicate for the aeroplane must be sent with or before the machine. A minimum factor of safety of 6 throughout is essential.

(iii) No machine will be tested for military purposes unless it fulfils the conditions of one of the types used for military purposes. These are given in attached table.

(iv) The constructor, when applying to have his machine tested, should state his reasonable expectation of the performances of the machine.

(v) Aeroplanes submitted for test must be put through the whole of the tests unless damaged before their completion, or unless the Chief Inspector considers that the tests should be stopped for reasons of safety.

2. The Chief Inspector of Military Aeronautics is also prepared to examine and test aeroplanes which may be designed not for purely military purposes, but to demonstrate some practical or theoretical improvement in design or construction. The tests imposed in such cases will be at the discretion of the Chief Inspector.

3. Results of any test will be supplied to the constructor by the Chief Inspector, and will be kept secret, if desired by the constructor. Should the constructor wish to publish the result of the test, it is to be understood that the result should be published complete. Should only part of any report of the test be published, the Chief Inspector reserves the right to publish it in full.

4. The satisfactory performance of the tests laid down in paragragh 1 does not constitute a guarantee that the aeroplane in question will be purchased by Government.

5. These tests may be altered from time to time ; notice will be given as early as possible of any alteration.

War Office.

February, 1914.

PERFORMANCES REQUIRED FROM VARIOUS MILITARY TYPES.

	Light Scout.	Reconnaissance Aeroplane (*a*).	Reconnaissance Aeroplane (*b*).	Fighting Aeroplane (*a*).	Fighting Aeroplane (*b*).
Tankage to give an endurance of ...	300 miles	300 miles	200 miles	200 miles	300 miles
To carry	Pilot only	Pilot and observer plus 80 lbs. for wireless equipment	Pilot and observer, plus 80 lbs. for wireless equipment	Pilot and gunner, plus 300 lbs. for gun and ammunition	Pilot and gunner, plus 100 lbs.
Range of speed ...	50 to 85 m.p.h.	45 to 75 m.p.h.	35 to 60 m.p.h.	45 to 65 m.p.h.	45 to 75 m.p.h.
To climb 3,500 feet in	5 minutes	7 minutes	10 minutes	10 minutes	8 minutes
Miscellaneous qualities	Capable of being started by the pilot single-handed	—	To land over a 30-ft. vertical obstacle and pull up within a distance of 100 yds. from that obstacle, the wind not being more than 15 m.p.h. A very good view essential	A clear field of fire in every direction up to 30° from the line of flight	A clear field of fire in every direction up to 30° from the line of flight

Instructional aeroplanes with an endurance of 150 miles will also be tested under special conditions ; safety and ease of handling will be of first importance in this type.

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FLYING AT HENDON.

ST. VALENTINE'S Meeting at Hendon last Saturday provided plenty of interesting flying in spite of the terrible weather that arrived with the afternoon. The wind, blowing at something like 40 m.p.h., prevented the speed handicap down on the programme from taking place, so a cross-country handicap was held in its place, and even this had to be flown over three instead of the usual four laps of the Bittacy Hill course (12 miles), whilst the race had no sooner started than an unpleasant driving rain came down. Earlier in the afternoon several exhibition and passenger flights were made by the Hendon pilots, including A. Cripps—a new pilot who has but recently taken his "ticket" at the Grahame-White school—W. Birchenough, and L. Strange on 50 h.p. G.-W. biplanes, R. H. Carr on the remarkable little G.-W. tractor biplane "Lizzie," Louis Noel on the G.-W. Maurice Farman, Philippe Marty on the 80 h.p. Blériot and Morane-Saulnier monoplanes, F. W. Goodden on the 45 h.p. Caudron, and J. L. Hall on his Avro. Goodden made a very spectacular flight, ascending to a height of about 3,000 ft. and banking and diving in splendid style. Mention must also be made of Pierre Verrier, who came out on a new Maurice Farman just before the cross-country race started, and put up some of his hair-raising but masterly stunts, "diving upwards," as somebody described it, in an extraordinary manner. Just before 4 o'clock a start was made for the cross-country handicap, the competing machines being taxied out over to the far end of the aerodrome, in order that they might start head to wind. Altogether eight machines lined up for this event, and started off in the following order :—A. Cripps (11 mins. 56 secs.), W. Birchenough (9 mins. 56 secs.), and L. Strange (9 mins. 16 secs.), all on 50 h.p. G.-W. biplanes ; Claude Grahame-White (4 mins. 56 secs.), on the G.-W. Maurice Farman ; Pierre Verrier (2 mins. 56 secs.), on a Maurice Farman ; R. H. Carr (2 mins. 9 secs.), on the G.-W. tractor ; Louis Noel and passenger (21 secs.), on the 80 h.p. Blériot ; and Philippe Marty and passenger (scratch), on the 80 h.p. Morane-Saulnier. It should be mentioned here that Noel was flying a monoplane, practically speaking, for the first time, and under conditions that were by no means favourable, so that the splendid way in which he handled his new mount in the race stands very much to his credit. The limit man had no sooner got outside the aerodrome than he experienced engine trouble, and had to descend on the golf links at Totteridge. After completing two laps, Grahame-White landed in the aerodrome owing to his engine not running as it should, but with the exception of Verrier the others eventually crossed the line. The two remaining G.-W. 'buses, piloted by Birchenough and Strange, provided no small amount of interest in the race, for they kept very close together, and only changed positions towards the end of the finish, when Strange, who was flying the rebuilt 'bus, overhauled his rival on the 'bus Manton used to fly. In the meanwhile, Carr, on "Lizzie," was rapidly catching up, and it could be seen that the finish was going to be exciting. The first to cross the line was Strange, with Carr, who had dived under both the 'buses at the last moment in order to pass them, alongside him, and ⅕ sec. behind. Strange came in third, 2⅗ secs., after Carr, whilst Marty just managed to obtain fourth place from Noel by 5 secs. Verrier only gave up at the end of the last lap, and bringing his machine head to wind he proceeded to soar over the centre of the aerodrome for some ten minutes, eventually stopping his engine and making a silent spiral glide to earth. After this Noel made a final flight on the Maurice Farman, and the proceedings were brought to a close.

Cross-Country Handicap. (12 miles.)	Handicap.	Handicap Time.
	m. s.	m. s.
1. L. Strange (50 h.p. G.-W. 'bus No. 109) ...	9 16	32 1
2. R. H. Carr (50 h.p. G.-W. tractor biplane)	2 9	32 1⅕
3. W. Birchenough (50 h.p. G.-W. 'bus) ...	9 56	32 4
4. Philippe Marty (80 h.p. Morane-Saulnier monoplane)	scratch	32 22
5. Louis Noel (80 h.p. Blériot monoplane) ...	0 21	32 27

P. Verrier (70 h.p. M. Farman), 2 m. 56 s. ; C. Grahame-White (70 h.p. M. Farman), 4 m. 56 s. ; A. Cripps (50 h.p. G.-W.), 11 m. 56 s., retired.

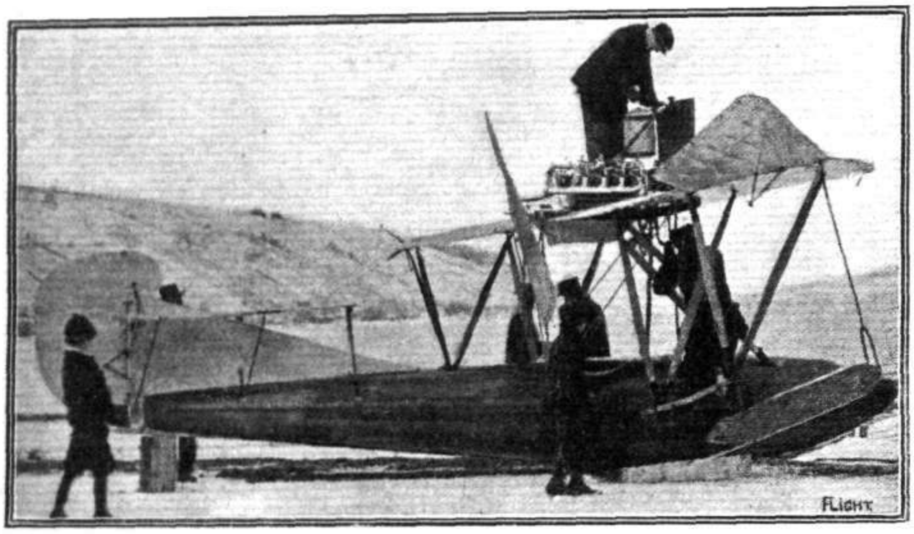
A TYPICAL AFTERNOON AT HENDON AERODROME.—Watching the flying.

"Flight" Copyright.

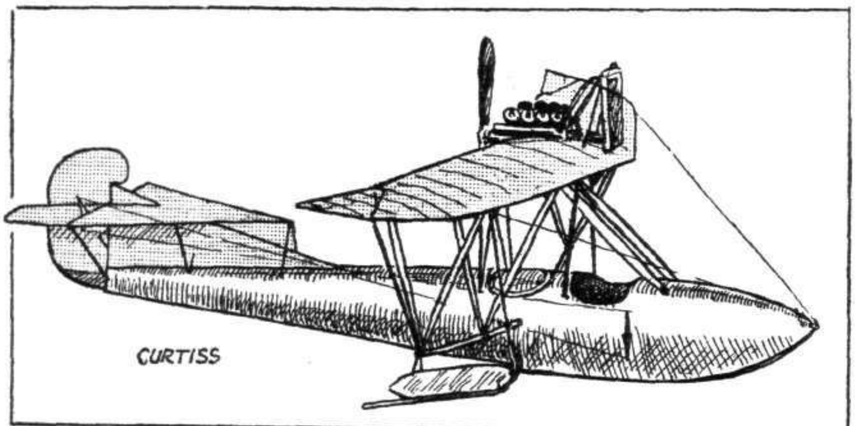
THE CURTISS MONOPLANE FLYING BOAT.

AN extremely interesting machine has been turned out just recently at the Hammondsport factory, where the Curtiss machines are built. It has been specially built for Mr. Raymond V. Morris, of New Haven, Con., and differs very considerably from the other machines turned out by the Curtiss firm. In the first place, it is a monoplane; and secondly, the design and construction of the hull are new. Early in January its owner put it through some tests on Lake Keuka, New York, with very successful results. Perhaps the most interesting feature of this new Curtiss machine is to be found in the wings. These are of the form that is so popular in Germany, known as the "arrow plane," in which the wings are swept back so that in plan form they resemble an arrow-head. The wing section employed on this new machine is similar to that of the Blériot XI *bis* and the B.E. 2, and the method of wing bracing is like that found on many of the "taube" machines in Germany. The wings are mounted some 4 ft. above the hull and are attached to a steel superstructure forming the engine bed, whilst the bracing consists of four pairs of "V" struts, two on each side of the hull, the apex of each pair joining a single transverse spar extending under the wings from each side of the hull. In construction the wings follow usual practice, being built up of two main spars with ribs spaced at intervals of about one foot. The leading edge of the plane curves rearwards at the tips to a point where it meets the *ailerons*. The latter are almost triangular in shape, and are counter-balanced, that is, when one goes up the other goes down. The tail consists of a triangular plane with two elevator flaps hinged to the trailing edge mounted above the stern of the boat, together with a vertical fin, triangular in shape, and a rudder. The engine, as previously mentioned, is mounted in the centre and on the top of the plane, the propeller being situated immediately at the rear of the trailing edge of the latter. The type of engine fitted is one of the latest 90 h.p. 8-cyl. Curtiss O-X models, water cooled, with the radiator mounted in front on the leading edge of the plane. In addition to two pairs of tubular steel struts supporting the engine bed, a pair of stout wood struts extend forward from the engine to the hull to a point just in front of the pilot's cockpit, and serve to take the thrust of the propeller. In shape the hull is very like a torpedo, except that the stern tapers to a vertical knife-edge, and that the bottom from bow to about midships, where there is a step, is of the double concave type employed on the latest navy pattern Curtiss boats. The framework of the hull is built up of ash longitudinals and ribs. On the framework is a diagonal layer of $\frac{3}{32}$ in. mahogany planking, and over this is a covering of heavy "Sea Island" cotton set in marine glue. Another layer of mahogany planking of the same thickness, but laid longitudinally, forms the outer covering. Immediately under the plane is the pilot's cockpit, the seat being placed low down in the hull in order to afford ample protection for the pilot from wind and spray. A second hole has been cut in the top of the hull, just behind the pilot, for a passenger, but when the pilot only is on board this hole is covered up. An auxiliary float is attached to each outer extremity of the transverse bracing spar. The control is of the usual Curtiss pattern, shoulder yokes for the *ailerons*, rocking column for the elevator, and foot-bar for the rudder. The principal dimensions of this new air-boat are as follows:—Overall span from tip to tip of *ailerons*, 34 ft.; span of wings, 28 ft.; maximum chord, 5 ft.; wings swept back 7°; Supporting surface, 120 sq. ft.; length of hull, 22 ft.; maximum beam, 2 ft. 6 ins.; maximum depth, 3 ft.; weight with pilot and fuel, 1,200 lbs.

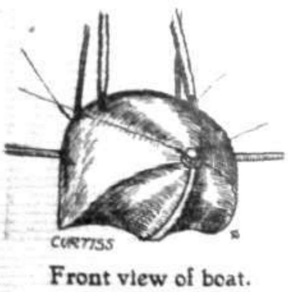
In view of the success of the new craft it is anticipated that the new model will prove to be very popular during the coming season. It will be remembered that Messrs. White and Thompson, Ltd., of Middleton, Bognor, are the representatives of the Curtiss firm in Great Britain.



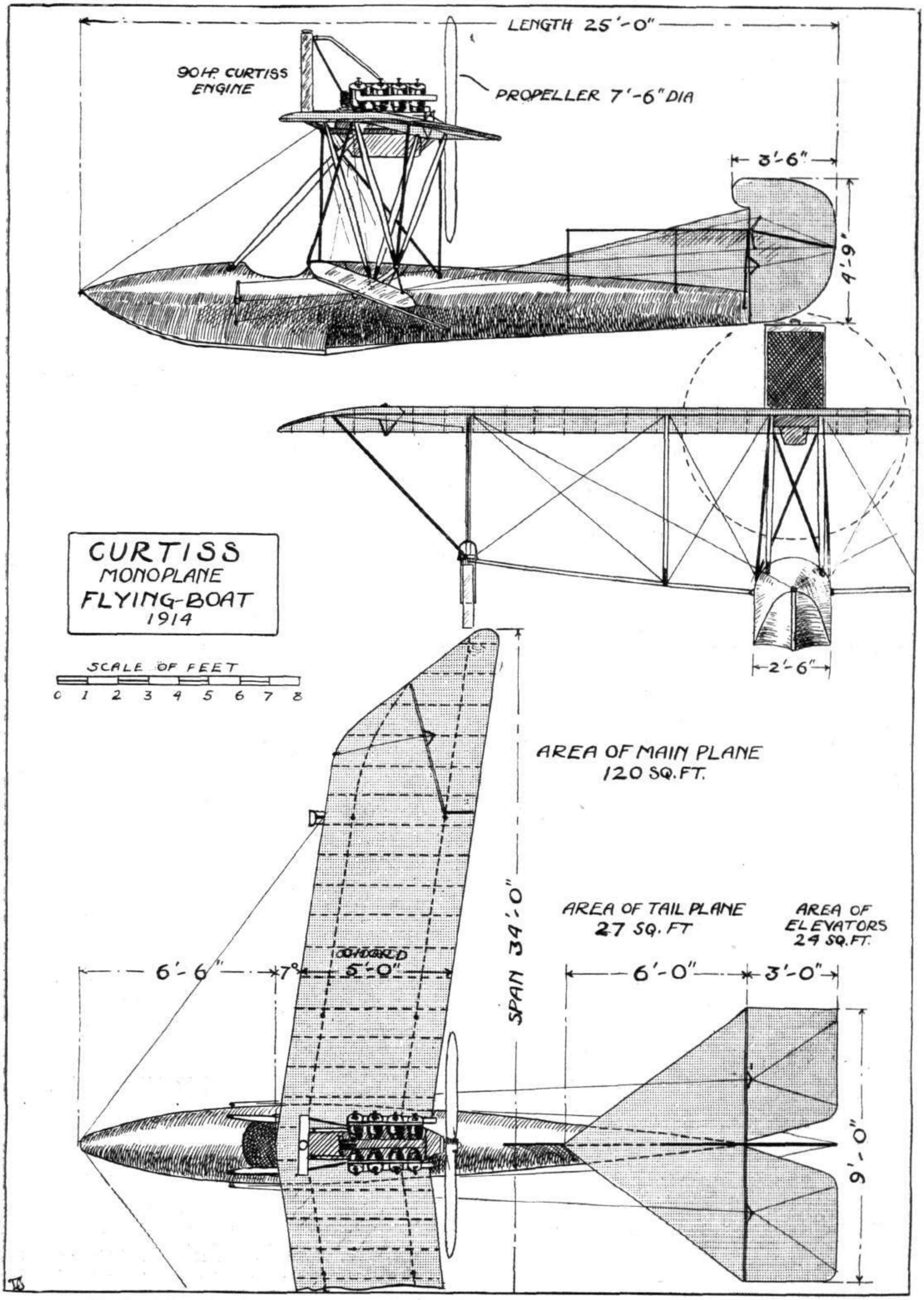
The Cu tiss monoplane flying boat.



The Curtiss monoplane flying boat.



Front view of boat.



THE CURTISS MONOPLANE FLYING BOAT.—Plan, side and front elevations to scale.

The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

ANNUAL DINNER.

In consequence of the First Lord of the Admiralty having been commanded to dine with H.M. the King on the 27th inst., the Royal Aero Club Dinner fixed for that date, at which Mr. Winston Churchill was to be the principal guest, has been postponed until WEDNESDAY, MARCH 4th. It will take place at the ROYAL AUTOMOBILE CLUB, PALL MALL, LONDON, S.W. (by kind permission), at 7.30 for 8 o'clock.

The Marquess of Tullibardine, M.V.O., D.S.O., M.P., the Chairman of the Club, will preside.

The number of applications for tickets having already exceeded the accommodation available, no further tickets can be issued.

Annual General Meeting.

The Annual General Meeting of the Members of the Royal Aero Club of the United Kingdom will be held on Tuesday, March 24th, 1914, at 4 o'clock, at 166, Piccadilly, London, W.

Notices of motion for the Annual General Meeting must be received by the Secretary not less than twenty-one days before the meeting, and must be signed by at least five members. Wednesday, March 4th, 1914, is the last day for the receipt of notices of motion.

Committee.

In accordance with the rules, the Committee shall consist of eighteen members. Members are elected to serve for two years, half the Committee retiring annually. Retiring members are eligible for re-election.

The retiring members of the committee are :—

Col. J. E. Capper, C.B., R.E.	A. Mortimer Singer.
G. B. Cockburn.	T. O. M. Sopwith.
Major J. D. B. Fulton, C.B., R.F.A.	The Marquess of Tullibardine, M.V.O., D.S.O., M.P.
J. T. C. Moore-Brabazon.	Roger W. Wallace, K.C.
Com. C. R. Samson, R.N.	

Col. J. E. Capper, C.B., R.E., does not offer himself for re-election.

The following members have so far been nominated :—

G. B. Cockburn.	Com. C. R. Samson, R.N.
Major J. D. B. Fulton, C.B., R.F.A.	A. Mortimer Singer.
	T. O. M. Sopwith.
Robert Loraine.	The Marquess of Tullibardine,
Fred May.	M.V.O., D.S.O., M.P.

Any two members of the club can nominate a member to serve on the Committee, having previously obtained such member's consent. The name of such member so nominated, with the names of his proposer and seconder, must be sent to the Secretary in writing not less than fourteen days before the Annual General Meeting. Wednesday, March 11th, 1914, is the last day for the receipt of nominations.

Members are reminded that a ballot paper for the election of nine candidates to seats on the Committee of the Club will be forwarded to them at least seven days before the date of the Annual General Meeting.

Committee Meeting.

A meeting of the Committee was held on Tuesday last, February 17th, 1914, when there were present : The Marquess of Tullibardine, M.V.O., D.S.O., M.P., in the Chair, Mr. Griffith Brewer, Mr. E. C. Bucknall, Col. J. E. Capper, C.B., R.E., Mr. G. B. Cockburn, Major J. D. B. Fulton, C.B., R.F.A., Col. H. C. L. Holden, C.B., F.R.S., Prof. A. K. Huntington, Mr. Mervyn O'Gorman, C.B., Mr. C. F. Pollock, Mr. T. O. M. Sopwith, Mr. Roger W. Wallace, K.C., and the Secretary.

New Members.—The following new members were elected :—Eng.-Lieut. W. Briggs, R.N., Henri Fabre, and Lieut. W. H. C. Mansfield.

Aviators' Certificates.—The following Aviators' Certificates were granted :—

732 **Filip Augustin** Björklund (Swedish Subject) (Grahame-White Biplane, Grahame-White School, Hendon). Feb. 3rd, 1914.

733 **Lieut. Francis** Hesketh Pritchard, R.G.A. (Vickers Biplane, Vickers School, Brooklands). Feb. 10th, 1914.

734 **Capt. Arthur** Burdett Burdett (Blériot Monoplane, Blériot School, Hendon). Feb. 10th, 1914.

735 **Lieut. Dudley** Stuart Kays Crosbie (Vickers Biplane, Vickers School, Brooklands). Feb. 16th, 1914.

736 **Lieut. Frank Burges** Binney (Bristol Biplane, Bristol School, Brooklands). Feb. 16th, 1914.

737 Richard Patrick Creagh (Vickers Biplane, Vickers School, Brooklands). Feb. 16th, 1914.

The following Certificate was passed in France :—

B. D. Ash (Maurice Farman Biplane, Etampes). Jan. 24th, 1914.

Aeronaut's Certificate.—The following Aeronaut's Certificate was granted :— 39. Capt. L. L. Atherton.

Airship Pilot's Certificate.—The following Airship Pilot's Certificate was granted :—

24. Capt. L. L. Atherton.

Gordon-Bennett Aviation Cup.—The following entries were reported :—

A. V. Roe and Co., Ltd.	Manchester.
Sopwith Aviation Co., Ltd.	Kingston-on-Thames.
British and Colonial Aeroplane Co., Ltd.	Bristol.

It was decided to send in a formal entry on behalf of three competitors to the Aero-Club de France.

Jacques Schneider International Maritime Race.—The following entry was reported :—

Sopwith Aviation Co., Ltd. ... ... Kingston-on-Thames.

It was decided to send in a formal entry on behalf of one competitor to the Aero-Club de France.

***Daily Mail* £10,000 Trans-Atlantic Flight.**—The entry made by the Aero Club of America on behalf of Rodman Wanamaker was reported.

Aviation Benevolent Fund.—The report of the Sub-Committee, together with Counsel's draft of scheme was received. It was unanimously resolved to establish an Aviation Benevolent Fund, the object being to relieve aviators, their wives, widows, and dependents when in necessitous circumstances. Full details of the scheme will be issued shortly.

It was unanimously resolved to vote a sum of Fifty Guineas as the Club's first donation to the Fund.

It was reported that the British Petroleum Company, Limited (the Distributors of Shell Motor Spirit) had kindly promised a donation of Fifty Guineas.

Alteration to Club Rule No. 7.—On the motion of Mr. C. F. Pollock, seconded by Col. H. C. L. Holden, it was unanimously resolved that Club Rule No. 7 be altered by deleting the words "but the names of retiring Members of the Committee shall be indicated by an asterisk."

This alteration will be submitted for confirmation of the Members of the Club at the Annual General Meeting.

The rule now reads as follows :—

"7. Ballot Papers.—Not less than 7 days before the Annual General Meeting a ballot paper shall be posted to every Member. The ballot paper shall contain the names of Candidates nominated for the Committee in the form of an alphabetical list. The same type is to be used throughout."

Aerial Navigation Orders.—Letter was read from the Home Office, stating that the revision of Orders was under consideration, and asking the Club if they had any amendments to suggest. The matter is under consideration.

Special General Meeting.

The Marquess of Tullibardine, the Chairman of the Club, presided at the Special General Meeting held on Tuesday last, the 17th inst.

Alteration to Rule 9.—Col. H. C. L. Holden presented a statement regarding Rule 9 of the Club Rules dealing with the method of election of the Committee. The following Members took part in the discussion :—Mr. A. S. E. Ackermann, Mr. Harry DelaCombe, Mr. J. H. Ledeboer, Mr. M. O'Gorman, and Mr. C. C. Turner.

The recommendation of the Committee to add the words "or less" was eventually carried, the voting being 40 in favour and 10 against.

Rule 9 now reads as follows :—

"Invalid Ballot Papers—No ballot paper which is signed or on which the number of Candidates voted for is more or less than the number of vacancies or which is received by the Secretary later than 12 noon on the day preceding the Annual General Meeting shall be valid."

New Club Premises.—Col. H. C. L. Holden reported the result of the replies to the circular issued to Members in October last, when they were asked to answer the following questions :—

1. Are you in favour of the Royal Aero Club acquiring fresh premises with the usual facilities of a West End Club?

2. Would you, in this event, be prepared to pay an increased Subscription, say, not exceeding four or five guineas per annum, for present Members only?

About 1,450 circulars were issued, and 980 replies were received as follows:—

673 in favour of new premises and an increased subscription.

238 against.

69 in favour of new premises but against an increased subscription.

At the conclusion of a general discussion, the following resolution was carried unanimously:—

"RESOLVED that the Committee be empowered to take steps to acquire new premises by lease or purchase on such terms as it may think proper in the event of a favourable opportunity arising."

Monaco Aviation Meeting.

The International Sporting Club of Monaco is organising an aviation contest to take place from April 1st to the 15th, 1914, the prizes for which will amount to about £3,000. Rules and entry forms can be obtained from the Royal Aero Club.

166, Piccadilly, W. HAROLD E. PERRIN, Secretary.

FROM THE BRITISH FLYING GROUNDS.

Royal Aero Club Eastchurch Flying Grounds.

ON Monday and Tuesday of last week the greater number of the Naval officers were out getting through some fine flying. No flying was possible on Wednesday and Thursday owing to the gale. On Friday a new B.E. made short flights, and on Saturday B.E. and Sopwith short flights; owing to her Gnome missing the Sopwith was soon down. Sunday, gale.

Civilian Flying.—Tuesday, the Hon. Maurice Egerton made a fine flight on his 50 h.p. Short "Pusher." On Wednesday morning a surprise visit was made by Mr. Sydney Pickles who arrived driving his Chalmer car. Though not able to walk yet, Mr. Pickles gave an exhibition of a "short straight hobble." After going round seeing his many friends he again left for town with the hearty good wishes of all for a speedy and complete recovery. It is interesting to note that as it was his right leg which was broken, when driving his car he manipulates the clutch (as usual) with his left foot, and uses only the hand brake.

Brooklands Aerodrome.

MONDAY last week turned out a great improvement on the continuous rain and wind of the previous day, and as the wind was entirely absent for part of the day (although at one time it reached a velocity of 34 miles per hour) a lot of useful work was got through by the Bristol and Vickers pupils. Mr. Alcock was out on the Maurice Farman (100 h.p. Sunbeam) biplane, and Herr Roempler on the D.F.W. biplane, whilst a successful trial was made of the new Martinsyde monoplane. Major Brooke Popham called *en route* for Farnborough from Shorncliffe.

There was less wind Tuesday, the variations being from calm to a 20 mile an hour breeze. Herr Roempler, with Mr. Cecil Kny as passenger, flew to Farnborough on the D.F.W. biplane in the morning. Mr. Raynham, with Mr. MacGeagh Hurst as passenger, accomplished another first class performance by taking his 80 h.p. standard model Avro biplane up to an altitude of 14,420 ft., thus beating the previous British record accomplished by Mr. Hawker in June, 1913, on the Sopwith tractor biplane of 12,900 ft. A further good test was made of the new Martinsyde monoplane. Mr. Dukinfield Jones took his Flanders biplane up to 3,250 ft. Herr Roempler returned from Farnborough on the D.F.W. biplane. Lieut. Prichard passed his *brevet* tests on a Vickers biplane in workmanlike fashion, rising to 300 ft., in his figures of 8, and to 850 ft. in the altitude test; whilst Lieut. Crosbie passed the altitude part of his *brevet* test on a similar machine, rising to 750 ft.

There was no flying on Wednesday, the wind variation being between 4 and 38 miles per hour.

On Thursday again no flying was possible, as the wind was blowing up to 40 miles an hour. A novel machine called the Varioplane arrived, and its *début* is being looked forward to with much interest.

On Friday, no flying at all was possible with a gale of wind blowing up to 60 miles an hour, and on Saturday the force of the wind was still great (40 miles an hour), and only two machines were out. Mr. Raynham took a passenger (Mr. Acland) for a flight up to 3,250 ft. on the 80 h.p. Avro biplane, and afterwards Mr. J. Alcock took up the same passenger on the Maurice Farman (100 h.p. Sunbeam) biplane.

On Sunday, notwithstanding a gusty wind blowing at over 40 miles per hour, Mr. Raynham went up on the 80 Avro, the machine flying most steadily. The ballot for the free passenger flight had to be drawn three times ere a claimant put in an appearance in the person of Mr. E. L. Mather, of Lunesdale, Beckenham, who was taken for a good flight by Mr. Raynham on the Avro biplane in a 34 mile an hour wind. Mr. J. Alcock was also out on the Maurice Farman biplane, which was flying strongly and well against the wind. Mr. Pixton was testing the engine of the new "tweenie" (in size between the tabloid and the ordinary 80 h.p. tractor type) 100 h.p. Gnome-engined Sopwith biplane.

Mr. F. Warren Merriam is almost himself again and is taking a fortnight's rest in Cornwall before resuming his duties at Brooklands, and in the meantime his old pupil and present assistant instructor, Mr. Frank Halford, is working hard with the pupils at the Bristol School. The British and Colonial Aeroplane Co., Ltd. have contributed £5 5*s*. towards the Percy Lambert Memorial Fund.

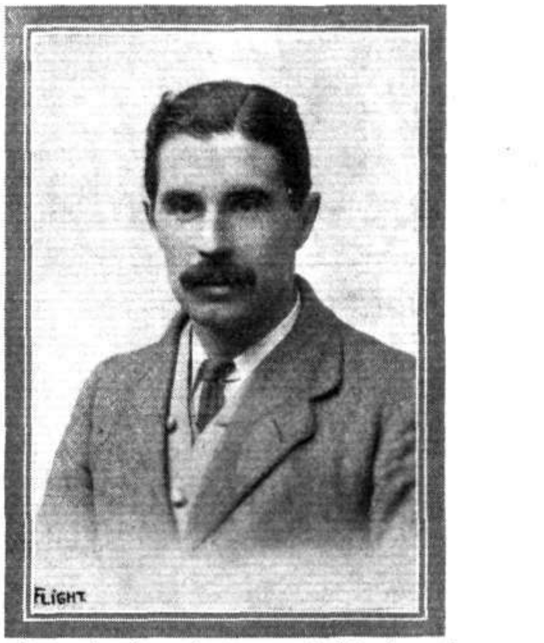
Bristol School.—The only tuition during last week was carried out on Monday morning, when the wind dropped. Sippe went out for a test flight, and then handed over the machine to Air-Mechanic Locker, who flew solo straights and circuits for 30 mins. Lieut. Binney also made several solo flights with landing practice, being in the air for 30 mins., followed by Lieut. Lawrence on solos for 20 mins.

The high wind and rain prevented any further attempt at tuition during the week.

Vickers School.—Monday, last week, Barnwell, Knight and Elsdon instruction on biplanes to Lieuts. Mansergh and Jackson. Capt. Ross Hume, Mr. Spencer Warwick, Lieuts. Prichard and Crosbie, solos. Knight with Mr. Hurst. Messrs. Hinshelwood and Chataway on No. 5 mono.

Lieut. Prichard very good *brevet* performance on biplane No. 21, Tuesday. Lieut. Crosbie solo circuits. Knight with Capt. Ross Hume.

Friday, Knight and Elsdon instruction on biplane to Lieuts. Jackson and Mansergh. Lieut. Jackson solo straights and circuits.



Lieut. Crosbie, who has just passed his *brevet* tests on biplane at the Vickers School, Brooklands.

Eastbourne Aerodrome.

ON Thursday last week, Mr. Hamel gave another of his exhibitions of looping the loop in a high wind. No school work was possible until Monday, when Gassler tested the new E.A.C. tractor biplane. Fowler was out with Mrs. Salmon, and Hunt was up on the Bristol.

Tuesday morning early, Hunt was out on the new tractor, and Fowler took Mrs. Salmon up three times on the E.A.C. 'bus. Two Army machines paid the aerodrome a visit during the morning, one being an 80 h.p. H. Farman from Folkestone, piloted by Lieut. Sheckelton, and the other, also from Folkestone, the F.E.-2, piloted by Lieut. Smith.

London Aerodrome, Collindale Avenue, Hendon.

Grahame-White School. — 8th Feb., Messrs. Piercy and Green, straights with Instr. Strange in passenger seat last Sunday week. On Monday Mr. Howarth and Mr. Cripps, solo circuits, and Tuesday Mr. Francis straights with Mr. Strange in passenger seat, and afterwards solo straights. Mr. Clarke solo straights and Mr. Howarth solo straights.

Aircraft Co. School.—On Thursday, Feb. 12th, Verrier was out on a new type British-built Maurice Farman machine. This machine has a monoplane tail, but no front elevator, while the *fuselage* is mounted between the planes. Although there was a

considerable wind blowing at the time, several flights with passengers were made over the surrounding country.

Last Saturday, Verrier started off for Farnborough at 8.30 on a new Maurice Farman, in a wind of about 45 miles an hour, but finding his speed was slow postponed the delivery of machine. On Monday he left the aerodrome at 9 o'clock, and arrived at Farnborough some 35 mins. later, at a height of 7,500 ft. His descent with the propeller completely stopped was very fine. Capt. Becke, on a B.E. biplane, then very kindly flew to Hendon, carrying Verrier as passenger. Verrier then returned with another British-built Maurice Farman to Farnborough. Later he put both machines through the necessary tests in his usual brilliant manner.

Blériot School.—Last week under the instruction of Mr. Jules Teulade, Messrs. H. O'Hagan and W. F. Cooper doing straights. Capt. Burdett, who has proved a very able pupil, passed all trials for his certificate in very good style.

W. H. Ewen School.—On Tuesday last week, school out at 8.30 a.m. After test flight by M. Baumann on *brevet* machine, Lieut. Kinnear did straights and half-circuits. On Wednesday morning M. Baumann made a test flight on *brevet* machine, but found it too bumpy for school work.

Salisbury Plain.

Bristol School.—The high winds, accompanied by fog and rain, during the whole week made flying tuition at Salisbury Plain out of the question, the wind at times blowing in gusts of over 40 miles per hour. Much useful instruction was, however, given to pupils in the sheds.

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EDDIES.

It is a pity that Raynham's climb to 15,000 ft., before his great glide from Brooklands to Hendon, was not done under official observation, and had to be repeated. The second time he only reached 14,420 ft. with a passenger on board; nevertheless, it was a real good flight, and captures the English altitude record. Chatting with Mr. A. V. Roe at Hendon on Saturday last on things in general, I learnt that the new 100 m.p.h. Avro, which will be shown at Olympia, will have a range of speed of 100–35, which is something to be proud of. He also mentioned something about air-anchors, but did not go into details, evidently wishing to "leave a gallop for the avenue." I am therefore looking forward with great interest to the coming Show, and am fully prepared to be surprised once more by this surprising firm. Only last week I was looking through some old photographs, and found some of Mr. Roe flying his triplane at Lea marshes—some little difference between this and the latest Avro with its staggered planes and neat cowl. "Roe the hopper" was possibly true to some extent in those days—just now he must be hopping with seven-league boots on.

Hendon Redivivus

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It was good to hear from Mr. Birkett that the Slack fund is being very well supported. Those who have not yet sent in their little donation are reminded that it is not too late, and that the modest half-crown will be greatly appreciated from those who would like to subscribe their mite but cannot afford more. Quite a touch of nature was to be seen at Hendon on Saturday, when Sydney Pickles, still on his crutches from the result of his own accident, was found putting down his name as a subscriber to the fund of a less fortunate brother aviator.

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With a subscription of twenty guineas to the Slack fund the I.C.S. have come along in their usual spirit, and shown that they do not forget their old pupils. Bobby Slack was of course a pupil of theirs, and afterwards flew their Blériot monoplane on a tour of many weeks' duration. There are many schools in London, established to teach anything from bioscope operating to poultry farming, but in a good many cases their interest ends with the payment of the fee, and the pupil is got through as quickly as possible, to their, if not his own, satisfaction. I have spoken to several old pupils of the I.C.S., and one and all have expressed themselves satisfied with the treatment they received, and the thoroughness of the tuition. I have noticed, too, that there is great camaraderie between the wearers of the button.

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By adding Mont Blanc to its other conquests, the all-conquering aeroplane is proving its utility and the possibilities of flying in a way that should convince the most unbelieving. By the way, I read that Mr. Orville Wright, who, with his brother Wilbur, was the pioneer of aviation in America, does not at the moment think it at all possible for any aeroplane to cross the Atlantic. He says that, in his opinion, there is not at the moment any aero engine capable of the strain of working all out for 17 or 18 hours at a stretch, and that until we get engines capable of this, it is, in his opinion, foolish to attempt the feat. We are bound to lend an ear when such an authority as Mr. Wright talks on aviation, but there have been so many magnificent flights put up lately that one hardly knows what to expect.

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It is not quite clear to me if M. Jean Ors is claiming for his newly-invented parachute a method whereby a pilot may seek safety in the event of an accident to his aeroplane, or whether it is simply a new sensational stunt. Seeing that M. Ors sat under the aeroplane, and that his parachute was fixed beneath the *fuselage*, it does not seem to me to go far towards attaining the former, and parachutes have been tried before as a method of descent from aeroplanes. One that promised to be quite effective was introduced by Mr. Prenseil and tried at Hendon last year. I have not seen or heard anything of it for a long time now, and am wondering why it was not taken up. The idea was, and it seemed to work well, to discharge the parachute from a cylinder of compressed air situated just behind the pilot. The rope descending from the envelope finished in a belt round the pilot's waist, and the force used was only just sufficient to take the parachute to the extent of the rope length, when, assuming that an accident had happened and that the machine was falling, the pilot would leave the machine and be suspended in the air. It seemed to me quite good and well worth following up. "WILL O' THE WISP."

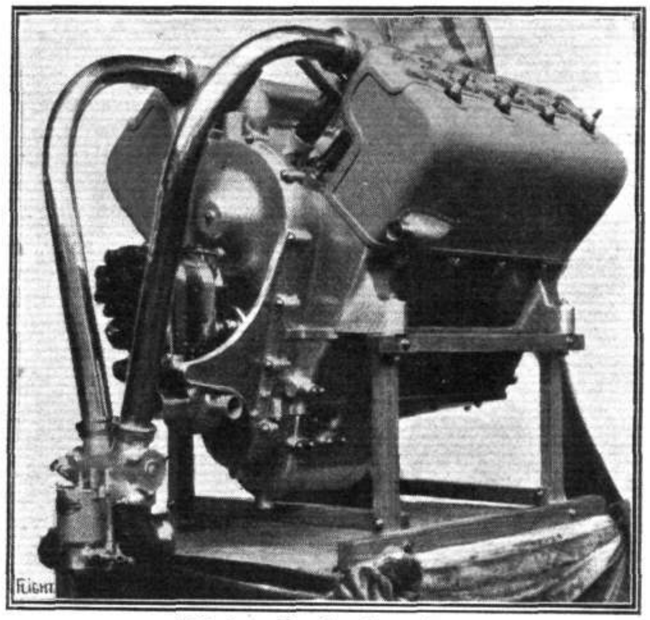

Wounded Birds at Hendon.

AERO ENGINES AT PARIS SHOW, 1913.

(*Concluded from page* 163).

Panhard-Levassor.

These well-known manufacturers exhibit their 8-cylinder 100 h.p. water-cooled vee engine, in which the cylinders are arranged in groups of four cast *en bloc*, a construction that lends itself greatly to rigidity, a desirable quality in engines of this class. These cylinders are of cast iron, and it will be observed from the accompanying illustration that the ribbing which was originally formed on aluminium side-plates on the outer side of the jacket is now omitted, as are also the two tie-rods between the heads of the cylinders. Both inlet and exhaust valves are mechanically operated.



100 h.p. Panhard engine.

The propeller is mounted on an extension from the end of the camshaft, which is driven by gearing from both ends of the crankshaft, with the object of reducing torsional oscillation in the latter. This construction necessitates an increase in the diameter of the camshaft, which therefore is slightly heavier, although since the timing gears, and the bearings, &c., need not be capable of transmitting and supporting the full engine torque, it is possible that the actual engine weight is not thereby increased, and in any event by its adoption the gear is probably much more silent and durable as well as more efficient after a period of use.

It should be noted that the water pump, which is placed immediately beneath the magneto, has two outlets—one on each side of the engine—so as to equally distribute the water delivered between the two groups of cylinders, a precaution that should always be observed in order to prevent any possibility of a steam or air lock occurring in either group of cylinders.

Renault.

These motors embody the same construction as has been employed by this firm during the past few years, and which has proved so successful in aeronautical work on dirigibles as well as aeroplanes, namely, air-cooling by forced circulation through a casing fitted over the cylinders and the attachment of the propeller to the end of the camshaft. The two models exhibited were the eight-cylinder 70 h.p. and the twelve-cylinder 100 h.p., which were illustrated in FLIGHT for November 2nd, 1912. Both engines are of the vee type, the angle between the two groups of cylinders being 90° for the eight-cylinder and 60° for the twelve-cylinder engine. The crankshaft end bearings are of the roller type, but the intermediate bearings are lined with white metal. The air casing is capable of ready dismantlement, and in the 70 h.p. may be omitted if an effective method of cooling can be substituted by the purchasers. A single magneto is provided on the eight-cylinder engines, but two magnetos, entirely separate and driven off the timing shaft, are fitted on the 100 h.p. engine.

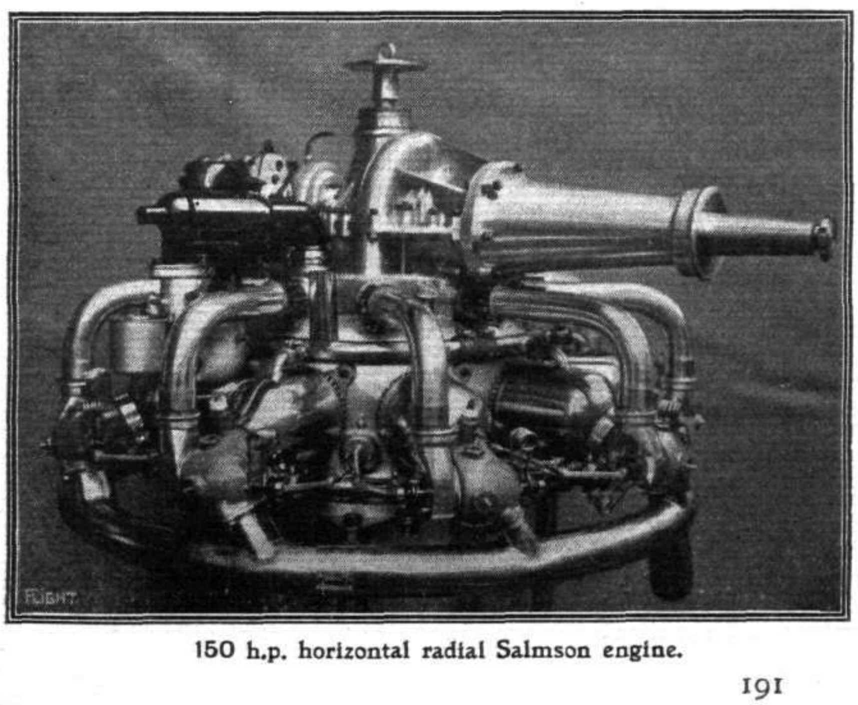
Messrs. Renault Frères now confine their activities to three different engines for aviation purposes—the two motors above referred to, and a 40 h.p. eight-cylinder engine of 75 mm. bore and 120 mm. stroke which runs at a speed of 1,800 revolutions per minute, and weighs 212 lbs. The price of this engine is 8,000 francs, and it is similar in design to the larger engines, but without the air casing.

Salmson.

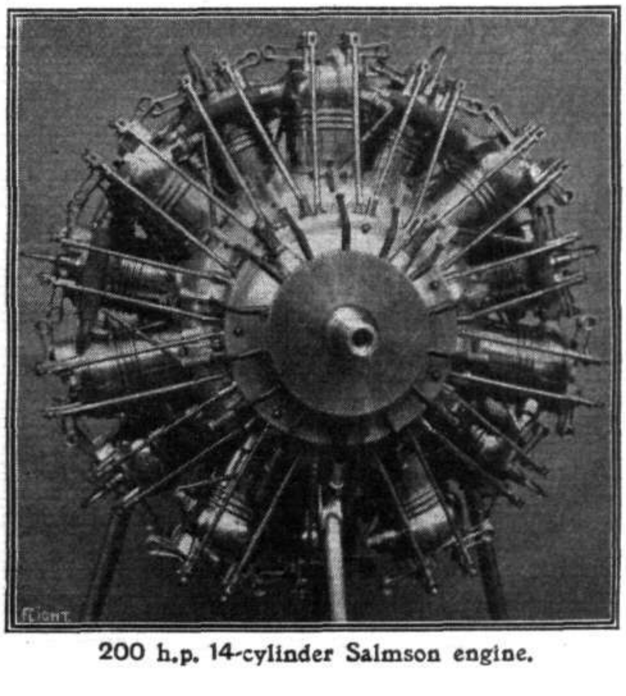
These engines, which have attained a large measure of success during the last two years, have recently been made more compact in design, are made in five different sizes, 90, 135, 150, 200 and 300 h.p., and in three types, all of which are stationary and water-cooled. The 150 and 300 h.p. engines are, however, arranged with their cylinders in a horizontal plane, and the 150 h.p. engine has a bevel-reducing gear to the propeller-shaft embodied in a casting fitted to the crank-case, giving a gear reduction of 1·8 to 1.

The cylinders in all models are made of steel, and have cast-iron heads for the reception of the valves, whilst the water-jackets, of copper, provided with expansion bellows, are brazed at the ends to the cylinders, as well as clipped between the cylinders and their attachments. The pistons are made of cast-iron, and have three rings fitted of similar material. The connecting rods articulate on a bronze bush supported on the crank-pin by two ball-bearings. The inlet as well as the exhaust valves, which are of ample size, are mechanically operated through push-rods and levers by cams arranged on a sleeve concentric with the crank-shaft. On the horizontal engines, which are specially designed for use on hydro-aeroplanes and dirigibles, these valves are arranged on the side of the head as shown, whilst on the other types, they are placed radially in the head.

The crank-cases are cast in aluminium on all models, but the construction employed varies considerably. On the vertically placed



150 h.p. horizontal radial Salmson engine.



200 h.p. 14-cylinder Salmson engine.

radial engine, it is in two parts, the one carrying the lugs for fixing the engine on the machine, whilst to the other the timing mechanism is attached ; both parts are bolted together, and in so doing secure the cylinders in position. The crank-chamber on the other two engines is made in one piece, the lower portion serving as a reservoir for oil, and the cylinders are attached in a special manner that allows of their ready dismantlement when necessary. The cylinders project for some distance into the crank-case on the vertical type of engines, and the excess oil is thereby prevented from falling into the lowermost cylinders.

The crankshaft is in two parts, the driving end with one web and crank-pin forming one piece, and the remaining web and journal orming the other part, a bolt passing through the web and the crank-pin to secure them in position.

Forced lubrication is provided to the cylinders, gearing, &c., and two carburettors are fitted to the crank-case, through which the gas passes by radial piping to the cylinders. The water pump and magneto are mounted on the crank-case at the rear of the engine, except on the largest model, where two magnetos are fitted, and the elaborate system of water piping employed may be seen in the accompanying illustration. It will be observed that on the vertical models the cooling water is passed through the water jackets of the several cylinders in succession, entering at the bottom, where it divides into two streams, and leaving at the top. On the other engines the water is taken to the cylinder and leaves by radial piping connected to main supply and return pipes surrounding the crank-case, so that each cylinder receives a separate quantity of water. On the 300 h.p. engine a collector is fitted, to which all exhaust piping is led, and which assists in silencing the exhaust. The orders of firing on the seven and nine cylinder engines are 1, 3, 5, 7, 2, 4, 6 and 1, 3, 5, 7, 9, 2, 4, 6, 8, respectively.

It is claimed that these engines, while developing high power, and

AERO ENGINES AT THE PARIS SHOW, 1913.

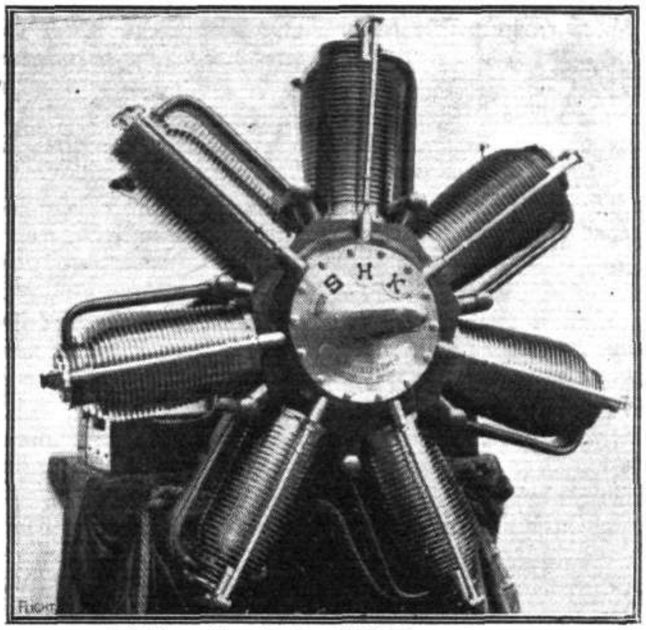
Name.	Type.	Cooling.	Cylinders. No.	Cylinders. Bore.	Cylinders. Stroke	h.p.	Revs. per min.	Weight. Total.	Weight. Per h.p.	Piston Speed.	Stroke/Bore	Type of Inlet Valve.	Price.
				mm.	mm.			lbs.	lbs.	ft. per min.			francs
Anzani	72° fan radial	Air	3	105	130	30	1,250	154	5·13	1,065	1·24	Auto	100 francs per nominal h.p.
	Star radial	,,	3	105	120	30	1,300	121	4·03	1,025	1·14	,,	
	,,	,,	6	90	120	45	1,300	154	3·42	1,025	1·35	,,	
	,,	,,	6	105	120	60	1,300	176	2·93	1,025	1·14	,,	
	,,	,,	10	90	120	70	1,250	216	3·10	985	1·33	,,	
	,,	,,	10	90	130	80	1,250	225	2·81	1,065	1·44	,,	
	,,	,,	10	105	140	100	1,200	298	2·98	1,100	1·33	,,	
	,,	,,	10	115	155	125	1,250	465	3·70	1,275	1·35	,,	
	,,	,,	20	105	140	200	1,250	683	3·41	1,150	1·33	,,	
Austro-Daimler	Vertical	Water	6	130	175	130	1,200	440	3·38	1,380	1·35	Mechanical	18,500
Chenu	,,	,,	4	110	130	65	1,800	254	3·91	1,540	1·18	,,	8,000
	,,	,,	4	110	130	90	2,300	258	2·87	1,960	1·18	,,	10,000
	,,	,,	6	110	130	100	1,600	397	3·97	1,365	1·18	,,	15,000
	,,	,,	6	150	200	250	1,500	950	3·80	1,970	1·33	,,	30,000
Clement Bayard	,,	,,	6	—	—	300	—	—	—	—	—	—	—
Clerget	,,	,,	4	110	120	50	1,450	214	4·28	1,140	1·09	Mechanical	10,000
	,,	,,	4	140	160	100	1,300	396	3·96	1,365	1·14	,,	19,000
	Vee	,,	8	140	160	200	1,300	640	3·20	1,700	1·14	,,	32,000
	Rotary	Air	7	120	120	50–60	1,180	198	3·30	930	1·00	,,	13,000
	,,	,,	7	120	150	80	1,180	216	2·70	1,160	1·25	,,	16,000
De Dion*	Vee	,,	8	106	120	80	1,800	465	5·81	1,420	1·13	,,	13,000
Demont	Rotary	,,	6	175	80	300	2,000	220	0·73	1,050	—	,,	—
D'Henain	,,	,,	7	—	—	50	—	—	—	—	—	,,	—
Edelweiss	Radial	,,	6	115	120	75	1,350	276	3·68	1,150	1·04	,,	14,000
	,,	,,	10	115	120	125	1,350	353	2·82	1,150	1·04	,,	22,500
E.J.C.	Rotary	,,	6	100	100	60	2,000	185	3·08	1,310	1·00	,,	13,000
Esselbe	,,	,,	7	110	120	65	1,250	167	2·57	985	1·09	Special	12,000
Gnome	,,	,,	7	110	120	50	1,200	172	3·44	945	1·08	Auto	13,000
	,,	,,	7	120	120	60	1,200	192	3·20	945	1·00	,,	13,000
	,,	,,	7	124	140	80	1,200	207	2·59	1,100	1·13	,,	17,500
	,,	,,	9	124	150	100	1,200	298	2·98	1,180	1·21	,,	22,000
	,,	,,	14	110	120	100	1,200	309	3·09	945	1·08	,,	24,000
	,,	,,	14	124	140	160	1,200	397	2·48	1,100	1·13	,,	35,000
	,,	,,	18	124	150	200	1,200	540	2·70	1,180	1·21	,,	44,000
	,,	,,	7	110	150	80	1,200	—	—	1,180	1·36	Special	17,500
	,,	,,	9	110	150	100	1,200	—	—	1,180	1·36	,,	22,000
Laviator	Vee	Water	8	100	130	80	1,200	275	3·43	1,020	1·30	Mechanical	13,000
	,,	,,	8	114	160	120	1,200	418	3·48	1,260	1·40	,,	19,000
	† Radial	Air	6	100	130	50	1,200	198	3·96	1,020	1·30	,,	10,000
	† ,,	Water	6	100	130	80	1,300	242	3·02	1,110	1·30	,,	11,000
Le Rhône	Rotary	Air	7	105	140	60	1,200	194	3·23	1,100	1·33	,,	13,000
	,,	,,	9	105	140	80	1,200	245	3·06	1,100	1·33	,,	16,000
	,,	,,	11	105	140	100	1,200	297	2·97	1,100	1·33	,,	19,000
	,,	,,	14	105	140	120	1,150	375	3·12	1,055	1·33	,,	24,000
	,,	,,	18	105	140	160	1,150	464	2·90	1,055	1·33	,,	30,000
Panhard-Levassor*	Vee	Water	8	110	140	100	1,500	440	4·40	1,380	1·27	,,	15,000
Renault*	,,	Air	8	96	120	70	1,800	396	5·66	1,420	1·25	,,	12,000
	,,	,,	12	96	140	100	1,800	638	6·38	1,655	1·46	,,	17,000
Salmson	Radial	Water	17	120	140	90	1,250	374	4·15	1,150	1·17	,,	16,250
	,,	,,	9	120	140	135	1,250	462	3·42	1,150	1·17	,,	21,500
	,,	,,	14	120	140	200	1,250	660	3·30	1,150	1·17	,,	32,000
	Horizontal radial	,,	9	120	150	150	1,250	—	—	1,230	1·25	,,	28,000
	,,	,,	9	150	210	300	1,200	990	3·30	1,650	1·40	,,	47,500
S.H.K.	Rotary	Air	7	110	140	70	—	154	2·20	—	1·27	Special	15,000
	,,	,,	7	124	140	90	—	198	2·20	—	1·13	,,	20,000
	,,	,,	14	110	140	140	—	308	2·20	—	1·27	,,	28,000
	,,	,,	14	124	140	180	—	396	2·20	—	1·13	,,	38,000

* Propeller on cam-shaft. † Two-stroke. *Note.*—Weights given for water-cooled engines are ex radiator and water.

having a low fuel consumption, possess an excellent degree of flexibility, the range of speed being from 300 to 1,350 revolutions per minute. These fine engines are now being constructed in England by the Dudbridge Iron Works, Ltd., Stroud.

S.H.K.

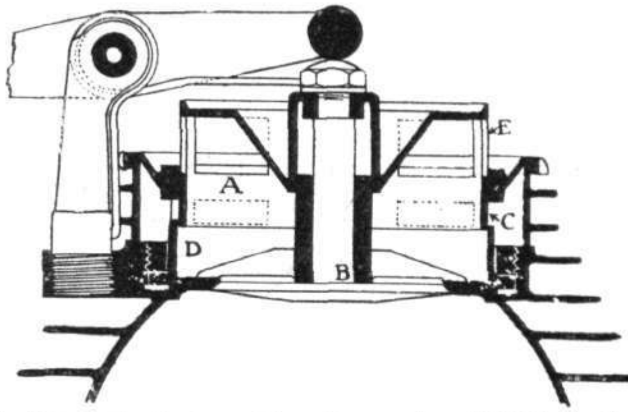
These engines, shown by Secqueville and Hoyau, are manufactured in four sizes, and are further examples of the all-steel construction—cylinders, piston, crank-case, inlet-piping, &c., all being made of forged steel, and no casting being used in the design.



70 h.p. 7-cylinder S.H.K. engine.

The cylinders are secured to the crank-case by means of a gland that screws into the crank-case on a flange formed at the base of the cylinder, a locking-ring being fitted to prevent the part from becoming loose. On the seven-cylinder engine the cranks are in two parts, the web remote from the propeller being mounted at the axis of rotation on a ball-bearing supported on a shaft fitted to the rotating crank-case, and on this fixed shaft the gearing for operating the valves is mounted. The connecting-rods are attached to the crank by feet, to which bronze shoes are riveted, two circular rings of ⊃ section encircling the lateral extensions along the shaft and effectively securing them in position. There are no rings fitted to the piston, but gas tightness is said to have been secured by cutting three shallow grooves round the piston.

The valves are mechanically operated by a single push-rod, and are of the special concentric design shown in the accompanying diagram. The cylindrical piston, A, is attached to the conical valve, B, which seats in a casing, D, secured to the cylinder. In the casing D, ports C are cut, making communication by means of radial piping with a central gas chamber which is fed through the crank-shaft from the carburettor. At the outer end of A, other ports, E, are made, which, as the valve is opened, register with the ports C. When the period of exhaust is reached, the lever depresses the central valve stem and places the interior of the cylinder into communication with the atmosphere. During exhaust the valve continues to move inwards until, at length, when the exhaust period is completed, the lower edge of the ports in the moving piston valve, A, commence to register with the inlet ports, C. Induction thus



Section through concentric valve used on S.H.K. Engine.

takes place through the inlet ports, whilst air is also drawn in through the ports, E, the proportions decreasing as the valve approaches the limit of its inward movement when the ports, E, are completely closed, and increasing as the valve returns, and finally closes the valve B. A coiled spring is fitted round the support for the rocking lever for closing the valve.

Oil is supplied under pressure by a plunger pump to the crank-pin, cams, gearing, &c., and high tension magneto ignition is fitted. The power/weight ratio of these engines is abnormally low.

"Flight" Copyright.

A view of one of the important floral devices which were a feature of the scheme of decoration at the Paris Aero Salon.

ARMCHAIR REFLECTIONS.

By THE DREAMER.

IN the day when Dick Whittington sat on the milestone at Highgate, and listened to the bells telling him in his imagination to return to success and prosperity, London was a city of worshipful companies and apprentices. Holywell Street and the treasures it held are lost to me for ever, and I can but look back on the hours I spent there rummaging through boxes of old books, as a man looks back on the hours spent with his first love. Holywell Street is no more. Some of its attractions are still to be found in Charing Cross Road, and the younger generation, no doubt, never having known anything better, are satisfied, but we who knew our love in her native village, as it were—we who could find her hidden away at the bottom of certain old trunks and could dig her out and enjoy her company behind screens and in shop entries, have no use for her in Charing Cross Road, splashed as she is with mud by the motor 'buses. To try and glean a sentence from Harrison Ainsworth with the hoot of motor horns in one's ears is impossible. I carry in my mind many happy recollections of things seen in Holywell Street. I remember a large engraving in a birdseye-maple frame priced at three guineas, and I religiously started every Monday to save up the money to buy it, only to make serious inroads into the fund before I got to the end of the row where now stands the statue of Gladstone. It represented Cheapside in the olden time. Picturesque with its old gables, inviting with its taverns and chop houses, I cannot but feel pleased that it is not of that picturesqueness to-day. Apprentices in jerkin and shorts stood about the court entries seeming to have nothing more to do than carry a large stick, yet when I look back I can plainly see those apprentices as representing the coming big men of the city. There was no royal road to success in those days without the precincts of the royal palaces. Courtiers finding favour with royal masters or mistresses might wake one morn to find themselves famous and one step nearer the Tower, but in trade, in silversmithing, in silk-mercing, in all the hundred and one businesses proclaiming a worshipful company resplendent in apron, magnificent under silken banner, there was but one way to the top; but one road whereby a youth might climb to an exalted position in his master's business—the apprenticeship. It is perhaps well that in these days when men and youths pass from one business to another, when any opening that offers a little more weekly salary is grasped, no matter what the business may be; when a man is jack of all trades and expert in none, it is, I say, perhaps well that the apprenticeship system should become practically obsolete, but it gave us good men of their trade and guaranteed a succession.

There was no reason to go to America in those days to find a man capable of managing a railway, because there were no railways, but when railways did start to lay their lines, reaching like tentacles through our peaceful valleys, men were wanted, and working on the only system then known, were moved up into higher positions as they became vacant. Then we started to live in irresponsible fragments. The great stores came along and taught us departments—we lead a departmental life. Everything is measured and cut and boxed and labelled for us by men who know nothing about anything except measuring and cutting and boxing and labelling in their respective ways.

The porter at the station is there to carry your luggage—ask him the time of the next train, and he will tell you—after he has looked at the time-table: ask a Waterloo porter, for instance, how to get across London to Euston and he will gaze at you open-mouthed—who ever wanted to go anywhere out of London except from Waterloo? And so when a new manager is wanted for an English railway, he has to be imported.

In aviation we have not yet become departmental. Perhaps, this is because the industry is so young; perhaps later on men will know one thing and one thing only, but at present the top rungs of the ladder of success in aviation are there waiting to be grasped by any who care to climb to them through the school of thoroughness.

It is easy to learn to fly; it is easy to pay a fee to be taught; it is easy to secure the coveted *brevet*, and it is easy to pass away into oblivion and be forgotten. Think for a moment of the hundreds of pupils who have joined the various schools and learned to fly; where are they? Scattered, gone. Where are the men who took up aviation seriously in the early days; who started in the workshops and sheds; who had to do anything and learn everything; who had to help to build a machine first and learn to fly it afterwards? You will find most of them still at it and generally somewhere near the top.

I cannot agree with Lord Claud Hamilton that it is necessary to go abroad to find men capable of filling high positions. The thinking men of England are every bit as good or better than they ever were, the trouble is they do not get the chance. Hedged in as they are by all sorts of restrictions; boxed up as they are in one department—often meaning, as it does, discharge to be found in another—how are they ever to know anything about the working of the machinery of which they are but one cog, coming round in their turn to engage with another cog, so forcing on the wheels of progress by ever so little towards an end of which they know little, and in time get to care less. In time, as they wear out, a new cog will emerge starfish-wise and gradually eclipse the old one, which will almost imperceptibly dissolve away into nothingness, his work done, forgotten. It may be that economy demands that it shall be one man one job in order, as would be most likely pointed out, that skill and exactness be obtained in each department, but it will never have the effect of bringing the good men to the top, and there will ever be a dearth of men with an all-round knowledge whilst the system obtains.

A Four-winged Monoplane.

A REMARKABLE monoplane has recently been built by the Ponnier works for M. Bonamy, who has entered it for the competition for safety devices. Very scanty details are at present to hand, but it appears that there are two sets of main planes, the first pair, of the usual Ponnier shape, having a pronounced dihedral angle for the purpose of securing lateral stability, while immediately behind them is a pair of wings, arranged in V form, as on the Dunne machine, for the purpose of obtaining longitudinal stability. The machine has been tested at Rheims by Bielovucic and Emile Vedrines, and, fitted with a 70 h.p. Gnome motor, easily lifted a load of 640 kilogs.

BRITISH NOTES OF THE WEEK.

THE ROYAL FLYING CORPS.

THE following appointment was announced in the *London Gazette* of the 13th inst. :—

R.F.C.—Military Wing.—Capt. John H. W. Becke, the Sherwood Foresters (Nottinghamshire and Derbyshire Regiment), from a Flight Commander to be a Squadron Commander, and to be granted the temporary rank of Major whilst so employed. Dated February 1st, 1914.

Mr. Sydney Pickles was last week-end at Hendon once again, and in our photograph he is seen placing his signature to the subscription list for the Slack Fund, which is receiving such sympathetic support.

The Number of British Airships.

REPLYING to a question in the House of Commons as to the number of airships owned or being built either by the Government or by contractors, Mr. Winston Churchill (First Lord of the Admiralty) stated that there are 15 dirigible airships built, building, or ordered at the present time for the Naval Wing. The majority will be ready for service with the Fleets when required during the next year. Mr. Churchill excused himself for not being more precise.

Army Aircraft.

REPLYING to questions by Mr. Joynson-Hicks, in the House of Commons on Wednesday, Col. Seely (Secretary for War) stated that 28 of the monoplanes which were on the list of efficient machines had been struck off at various dates since July 1st. One remained on the list as efficient. The Royal Aircraft Factory was now making 24 aeroplanes of a special type. All those Army officers who were engaged in the airship squadron of the Royal Flying Corps except one had agreed to be transferred to the Naval Wing. The exact conditions of their employment were still under consideration, but the hon. member might rest assured that they would not lose either in seniority, rank, or grading.

An Aviators' Benevolent Fund.

IT will be seen from the official notices on page 188 that the Royal Aero Club has decided to establish an Aviation Benevolent Fund with the object of relieving aviators, their wives, widows and dependents when in necessitous circumstances. The Club has opened the fund with a first donation of fifty guineas, and the British Petroleum Co., Ltd., the distributors of the well-known "Shell" motor spirit, have promised a donation of a similar amount. It is a scheme which merits the attention of all connected with aeronautics, and we feel sure it will meet with the financial support it deserves.

The Royal Aero Club Annual Dinner.

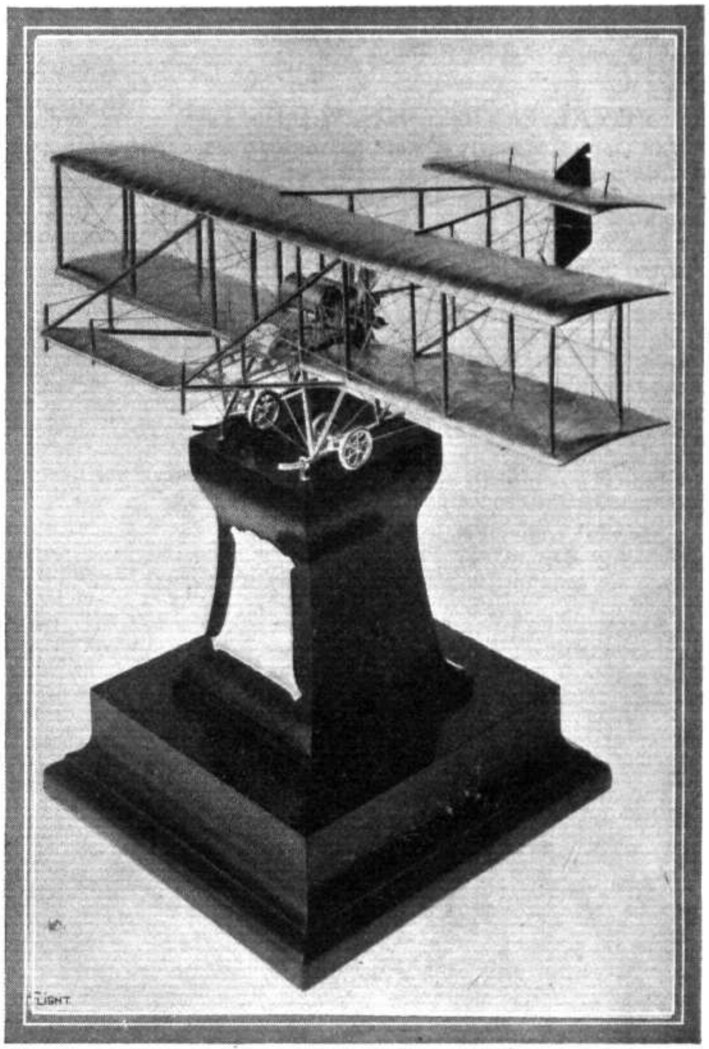
THE success of the annual dinner of the Royal Aero Club, which is to be held at the Royal Automobile Club on Wednesday week, is foreshadowed by the fact that the number of applications for tickets has exceeded the accommodation available, so that no further tickets can be issued.

Learning to Fly in Pictures.

ONE of the items in the programme of the special matinee at the Palace Theatre, at which the Queen has promised to be present, on Tuesday next, will be the Kinema film, "Learning to fly at Vickers' School." The matinee is for the benefit of the Schools for Mothers in Fulham, Poplar, Shoreditch and Stepney.

More Farmans for the R.F.C.

ON Monday morning Verrier flew a new British-built M. Farman from Hendon to Farnborough in fine style. Verrier then enjoyed a ride back to Hendon on a B.E. piloted by Capt. Becke, and took a second M. Farman to Farnborough, after which he put both machines through their official tests.



An exquisite specimen of the silversmith's art, being a scale model in silver of the Grahame-White biplane used by Mr. Birchenough, the winner of the trophy. This trophy was presented by the distributors of Shell Motor Spirit for a special speed contest. The model is the work of Messrs. Mappin and Webb, Ltd., of Oxford Street.

A Note on Raynham's Glide.

WITH reference to the paragraph in our issue of the 7th inst. recording Raynham's climb on the Avro to 15,000 ft. and his 20 mile glide from Brooklands to Hendon, it should be made clear that Mr. Harold Blackburn only accompanied Raynham on the way back to Brooklands, and was not with him during the long glide.

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

Official Notices.

1. **Meeting**—The eighth meeting of the present session will be held on Wednesday, March 4th, at 8.30 p.m., when Mr. Mervyn O'Gorman, C.B., M.I.M.E., A.F.Ae.S., will preside. Mr. Archibald R. Low, M.A., A.F.Ae.S., will read a paper on "The Rational Design of Aeroplanes," followed by a discussion.

2. **Nominations for the Election of Council.**—The last day for the acceptance of nominations for the Council will be Wednesday, February 25th next. Candidates for election must be nominated by two voters and no more (*see* Rules 6–13). In the event of nominations being received, ballot papers will be posted to voters on March 7th, and must be returned to the Secretary by 12 noon on March 18th, 1914.

Under Rule 7 the retiring members of Council are :—

Col. J. E. Capper, C.B., R.E.	J. W. Dunne.
J. H. Ledeboer.	F. K. McClean.
Maj.-Gen. R. M. Ruck, C.B.	Lieut.-Col. F. H. Sykes.

Under Rule 14:—

Dr. T. E. Stanton.	Dr. R. Mullineux Walmsley.

3. **Annual General Meeting.**—The annual general meeting of the Society will be held on Wednesday, March 18th, at 8 p.m., at the Royal United Service Institution, Whitehall, S.W. (Rule 39).

The last day for the receipt by the Secretary of notice in writing from any voter wishing to propose any subject for discussion at the annual general meeting is March 3rd.

B. G. COOPER, Secretary.

ROYAL FLYING CORPS (MILITARY WING).

WAR OFFICE summary of work for week ending February 6th :—

Flying Depôt. S. Farnborough.—Some reconnaissance and photography of troops were practised. Repair and experimental work continued.

No. 2 Squadron. Montrose.—The officer pilots were employed in making long reconnaissance flights across country.

No. 3 Squadron. Netheravon.—Various experimental work was done, and several long cross-country flights were made.

No. 4 Squadron. Netheravon.—A considerable amount of flying was carried out throughout the week. Another aeroplane was also flown from Farnborough for use with the Squadron.

No. 5 Squadron. S. Farnborough.—The first four days of the week were devoted to flying, and the remaining days to overhaul and repair work.

No. 6 Squadron. S. Farnborough.—The week was devoted to organising the squadron. Some flying was done.

For week ending February 13th :—

Flying Depôt. S. Farnborough.—Repair and experimental work was continued as usual. There was some flying done on B.E. machines.

No. 2 Squadron. Montrose.—The officer and N.C.O. pilots were out daily during the week. On Monday, the 9th inst., 1,393 miles were flown by the Squadron.

No. 3 Squadron. Netheravon.—Training was continued.

The poster which is to advertise the forthcoming Aero and Marine Exhibition at Olympia from March 16th to the 25th inclusive.

No. 4 Squadron. Netheravon.—In spite of some rough weather a considerable amount of flying was done by the officer pilots of the squadron. One machine was flown from Farnborough for use with the squadron.

No. 5 Squadron. S. Farnborough.—Some good practice was put in during the week, and much experience gained in flying in strong winds.

No. 6 Squadron. S. Farnborough.—The formation of the squadron was continued, and some flying done on B.E. and Maurice Farman machines.

British Team for the Gordon-Bennett Race.

IT is very gratifying to record that there is every prospect of Great Britain being adequately represented in this year's Gordon-Bennett Race. The Avro, Sopwith and Bristol firms have entered, and a formal entry for a full team of three has been forwarded to the Aero Club of France.

In connection with M. Blériot's candidature for the Seine General Council, as we mentioned last week, Blériot monoplanes were utilised for the dissemination of handbills and other election literature on behalf of M. Blériot. Above is seen one of the machines used at Buc, on the left being M. Blériot and in the pilot's seat M. A. Bidot, who piloted this 80 h.p. military machine in a 90 kilometre wind, the handbills being thrown out by Mr. T. Elder Hearn, who is also seen in the above machine.

FOREIGN AIRCRAFT NEWS.

A Height Record from Argentina.

BY cable from Buenos Ayres, we learn that on the 11th inst. George Newbery succeeded in getting up to a height of 6,220 metres on his Morane-Saulnier machine. Although this is higher than Legagneux's world's record of 6,120 metres, it cannot be recognised as a world's record, because it is not at least 150 metres more than the preceding record, which is the minimum required by the rules of the International Federation.

A Passenger Height Record in Germany.

THE height record for pilot and four passengers made by Garaix the other day was beaten by Thelen, at Johannisthal, on the 11th inst., when on an Aviatik biplane he took four passengers up to 2,850 metres. Garaix's record was 2,750 metres.

An Italian Passenger Record.

AT Turin, on the 10th inst., Sergeant Pettuzzi on a Maurice Farman biplane with 70 h.p. De Dion motor, and with a passenger, beat the Italian height record by getting up to 3,380 metres.

A Spanish Height Record.

SENOR DE POMBO HIBARRA, who last year made a fine flight from Santander to Madrid and has since started a flying school at Santander, last week beat the Spanish height record by going up to 3,000 metres. On Saturday week he made a flight of 120 kiloms. round Santander with a passenger.

The Duration Record Nearly Beaten.

ALTHOUGH it failed by the narrow margin of 20 mins. a splendid attempt was made on the 11th inst. by Langer to regain the world's duration record. Starting from Johannisthal he flew to Konigsburg, and was well on his way back when he had to stop owing to his fuel supply giving out at Kreuz near Posen. He had then been in the air for 16 hours. Ingold's record, referred to in last week's FLIGHT, was 16 hours 20 mins.

Pegoud at Buc.

ON Thursday of last week, Pegoud paid a visit to Buc and tested two Blériots, one a single seater fitted with a 50 h.p. Gnome, and the other a two-seater with an 80 h.p. Gnome motor. On both these machines he made some very fine flights, and showed that his looping and upside-down flying is now much more finished.

Testing a Parachute.

SINCE making some experiments with a parachute from one of the platforms of the Eiffel Tower about a year ago, M. Jean Ors has been searching for an aviator willing to take him up and allow him to throw himself from the machine in mid-air. Arrangements were at length made with Lemoine, who has a 100 h.p. Anzani-engined Deperdussin monoplane, and the experiment was successfully made at Juvisy on the 11th inst. With his parachute arranged under the *fuselage* and himself sitting in a temporary seat in the chassis of the machine, Ors was taken to a height of 300 metres and then threw himself out. The parachute quickly opened, and carried the daring experimenter safely to the ground in 40 secs. As far as could be seen, the balance of the machine was not seriously affected by being suddenly relieved of the weight of the passenger.

No More Looping Over Paris.

IN view of the fact that two aviators have recently looped the loop above the city of Paris, the police authorities have issued an order forbidding aviators when crossing the city to deviate from their normal flight.

Bielovucic Joins the Loopers.

HAVING obtained a Morane-Saulnier monoplane, with which he proposes to take part in the principal events of this year, Bielovucic has been practising upon it at Villacoublay. On the 12th he succeeded in looping the loop four times in succession.

PARMELIN'S FLIGHT OVER MONT BLANC.—A photograph showing a portion of this snow-clad height, over which M. Parmelin passed, a Deperdussin monoplane, on which the feat was accomplished, being seen in the photograph.

Night-Flying in France.

SPURRED on by the splendid records which have been made in Germany, special efforts are being made in France with a view to regaining the world's duration record. A great deal of attention is being paid to the question of continuing to fly after dark, and on the 10th inst. Maurice Farman, with the Marquis de Lareinty Tholozan as passenger, started from Etampes at 8.45 p.m., and making his way by Chartres, the Gallardon valley, Rambouillet and Versailles, landed safely at Buc, after flying for 1 hr. 5 mins. He had flown over to Etampes from Buc earlier in the day in 1 hour. On the previous Sunday Maurice Farman made several trips after dark over the country round Etampes.

A Challenge by Chevilliard.

BEFORE his departure for Egypt last week-end, Chevilliard issued a challenge to the winner of the Hamel-Garros match, which is announced to take place at Juvisy to-morrow (Sunday) afternoon.

Another Blériot Looper.

ON Monday at Buc, Guinard, who was attached to the Greek forces during the Balkan war, and has recently been practising at the Blériot school, succeeded in looping the loop three times.

Death of Emile Brodin.

EMILE BRODIN, who served as an aviator with the Servian Army for some time during the Balkan war, died in the Isle of Adam hospital on the 3rd inst. from injuries received while testing a machine fitted with an automatic stability device, on the previous day.

Johannisthal Barred to Military Pilots.

IN view of the several serious accidents which have occurred to machines when flying at Johannisthal, the German military authorities have forbidden any Army pilot from flying at the aerodrome for the present.

Marc Pourpe at Suez.

CONTINUING his travels in Egypt by aeroplane, Marc Pourpe on the 12th inst. started from Cairo and flew the 300 kiloms. to Suez.

Aerial Services for Egypt.

CONSIDERABLE interest has been taken by Lord Kitchener in the flying of Marc Pourpe in Egypt. It is reported from Cairo that in response to a request from Lord Kitchener, Pourpe has drawn up a report on his flight from Cairo to Khartoum and back.

Turkish Officers Flying to Cairo.

CONTINUING their flight the two Turkish officers, Capt. Fethy and Lieut. Nouri, who are flying from Constantinople to Alexandria, reached Konia on the 11th inst., while the next day Capt. Fenti flew across the Taurus mountains and arrived at Tarsus, and on Sunday he reached Beirut.

Parmelin's arrival at Aosta, after crossing Mont Blanc, on his Deperdussin monoplane. A snapshot taken within three minutes of his touching earth.

Parmelin at Turin.

AFTER his splendid flight across Mount Blanc, as recorded in our last issue, Parmelin intended to fly on from Aosta to Turin, but as during the next day there was no sign of the fog lifting, he decided to go on to Turin by train. He made some exhibition flights on his Deperdussin over the racecourse at Turin on Monday.

Flying Across the Straits of Gibraltar.

TWO Spanish officers, Capts. Ortiz and Herrera, succeeded in flying across the Straits of Gibraltar on a Morane-Saulnier monoplane, on the 14th inst. They started from Tetouan and landed at Seville, where they delivered to King Alphonso a message from the Spanish Commissioner in Morocco.

Waterplane Contest for Norway.

ARRANGEMENTS are being made in Norway for a competition for hydro-aeroplanes which it is proposed to hold in August next. The provisional programme is: August 22nd, Warnemunde to Copenhagen; August 23rd, Copenhagen to Aarhus; August 24th, rest; August 25th, Aarhus to Skagen; August 26th, Skagen to Gothenburg; August 27th, rest; August 28th, Gothenburg to Tonsberg; August 29th, rest; August 30th, Tonsberg to Christiania. The total distance would be about 900 kiloms. It is anticipated that the prizes will amount to at least £2,800.

Another U.S. Naval Aviator Killed.

THE new headquarters at Pensacola, Florida, of the flying corps of the U.S. Navy has started under sad auspices. On Monday, Lieut. Murray was flying above the bay when his machine fell from a height of about 800 ft. and before help reached the unfortunate officer he was dead.

A New Balloon Record.

A BALLOON, piloted by the German engineer Berliner, left Bitterfeld, near Leipzig, on Sunday last, and eventually landed on Wednesday about 150 kiloms. beyond Perm, in Russia. The distance traversed is given as 2,850 kiloms.—a new world's distance record. The previous record was 2,700 kiloms. in 87 hrs., to the credit of Hugo Kaulen, who also started from Bitterfeld.

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MR. HUCKS IN BIRMINGHAM.

IT is evident that, among aviators, the Birmingham public regard Mr. B. C. Hucks as their own hero. His popularity in Birmingham dates from the summer of 1912, when at a few hours' notice he flew from London to Birmingham to take the place of another pilot who did not like the prevailing conditions.

Then, at the beginning of last year, Mr. Hucks gave further successful demonstrations at the Tally-Ho Grounds, and later on, although he was just beaten by Mr. Gustav Hamel in the cross-country race round the city, he had a great reception.

Last Saturday, he gave demonstrations of looping the loop and upside-down flying at the same *rendezvous*, and from the large attendance one could easily see how Mr. Hucks ranks in the estimation of the Birmingham public. The programme was timed to start at 2.45, and for a long time before then a ceaseless stream of motor cars entered the ground. In spite of the unfavourable weather, by 3 p.m. at least 20,000 people lined the enclosure. A 40-mile-an-hour wind was blowing, and it was gusty, too. At 3 o'clock Mr. Hucks had his 80 h.p. passenger-carrying Blériot wheeled out, and did some fancy flying, after which he took up as a passenger Mr. Norman Holder, son of Sir John Holder, and during the course of that flight circled Sir John's residence.

Then the looping Blériot was brought out, and Mr. Hucks quickly ascended to a height of 2,000 ft., where at different intervals he made a total of six splendid loops. Descending, he was accorded a most enthusiastic ovation. Later, he ascended once more on the looper, and starting from a height of 2,000 ft. and flying across the wind, made a series of six loops in quick succession. This is claimed to be the first time on record that the feat has been accomplished.

Mr. Hucks gave another demonstration on Wednesday last before a crowd of about 6,000. There was a gusty breeze ranging between 30 and 40 m.p.h. Mr. Hucks was up first on the two-seater, reaching, in a slight shower of snow, a height of 4,000 ft., and came down by a fine spiral *vol plané*. Afterwards he was up for 10 mins. on the looping machine, and made six loops, which carried his total number of loops to 170. He was then forced to land owing to a defect in the oil feed to the engine. He was unable to execute any more loops, but made a fine trip on the two-seater with a passenger over the outskirts of Birmingham.

Mr. Hucks to Visit Oxford.

ON Thursday, Friday and Saturday next, the 26th, 27th and 28th inst., Mr. Hucks will be at Oxford. Exhibitions will be given each day, commencing at 3 p.m., from the Swimming Mead at the end of Whitehouse Road.

PROPELLERS.*

BEING A CO-ORDINATION OF SOME EXPERIMENTAL RESULTS AND THE DEDUCTIONS DRAWN FROM THEM.

By FRANCIS H. BRAMWELL, B.Sc., Associate Fellow.

THE material for this paper was collected for a written communication to the Research Committee for publication in the *Aeronautical Journal*, in the form of a brief annotated account of the work of a number of experimenters on the performance of the screw propeller in air and water; but, at the request of the Council, a month ago, the article has been re-cast in the form of a paper.

As can be readily understood, such a catalogue would be extremely boring to those who have so kindly come here to-night to listen, so that it was considered preferable to give only some general conclusions with sufficient experimental evidence to attempt to justify them. The short *résumé* has, however, been retained in the form of an appendix, for the use of those who desire to refer to it.

It is proposed to deal first with the question of corresponding speeds, which includes the consideration of how far results obtained in water or on model propellers in air or water may be taken as applicable to full-size air propellers.

The Application of the Laws of Similitude.—It is necessary, in order to make a strict comparison between the results obtained from any two propellers, that they should be exactly similar; that is, the one propeller should be, as it were, a photographic copy of the other, either larger or smaller.

This being so, the expressions for the thrusts of the two propellers, working in different fluids, are

$$t = \rho_1 l^2 v^2 f\left(\frac{v}{ln}, \frac{vl}{\gamma_1}, \frac{v}{\mathbf{V}_1}\right)$$

$$\text{and } T = \rho_2 L^2 V^2 f\left(\frac{V}{LN}, \frac{VL}{\gamma_2}, \frac{V}{\mathbf{V}_2}\right)$$

where l and L are any similar lengths in the two propellers, and may be taken as the diameters; v and V are their translational or forward speeds; and n and N their rotational speeds. ρ_1 and ρ_2 are the mass densities, and γ_1 and γ_2 the kinematic coefficients of velocity of the two fluids; $\mathbf{V}_1$ and $\mathbf{V}_2$ are the velocities of sound in the two fluids, these being a measure of the compressibility in the two cases. f is simply a general function of the three independent, non-dimensional variables $\frac{v}{ln}$, $\frac{vl}{\gamma}$ and $\frac{v}{\mathbf{V}}$.

Similar expressions to the above can be written down for the torques on the two propellers.

These formulæ look sufficiently complicated to make it appear difficult to see how they can be simply applied. Some experimental evidence will be brought forward, however, to show that the dependence on the viscosity and compressibility is so slight as not to introduce any serious errors if it be neglected entirely; the experimental evidence available on this point is still somewhat scanty, but that which has been collected confirms this view.

Under these circumstances the above equations reduce to

$$t = \rho_1 l^2 v^2 f\left(\frac{v}{ln}\right) \text{ and } T = \rho_2 L^2 V^2 f\left(\frac{V}{LN}\right)$$

which may be re-written

$$\frac{t}{\rho_1 l^2 v^2} = f\left(\frac{v}{ln}\right) \text{ and } \frac{T}{\rho_2 L^2 V^2} = f\left(\frac{V}{LN}\right)$$

If now the propellers be compared, when they are revolving in a similar manner, which is expressed by the statement that $v \div ln$ is equal to $V \div LN$, then it is seen that $\frac{t}{\rho_1 l^2 v^2} = a$ (a non-dimensional number) $= \frac{T}{\rho_2 L^2 V^2}$.

And under the same conditions we have for the torque $\frac{q}{\rho_1 l^3 v^2} = b$ (a non-dimensional number) $= \frac{Q}{\rho_2 L^3 V^2}$.

Also the efficiencies of the two propellers are the same, being $\frac{a}{2\pi b} \cdot \frac{v}{ln}$ and $\frac{a}{2\pi b} \cdot \frac{V}{LN}$ respectively, which are equal as $v \div ln$ is equal to $V \div LN$.

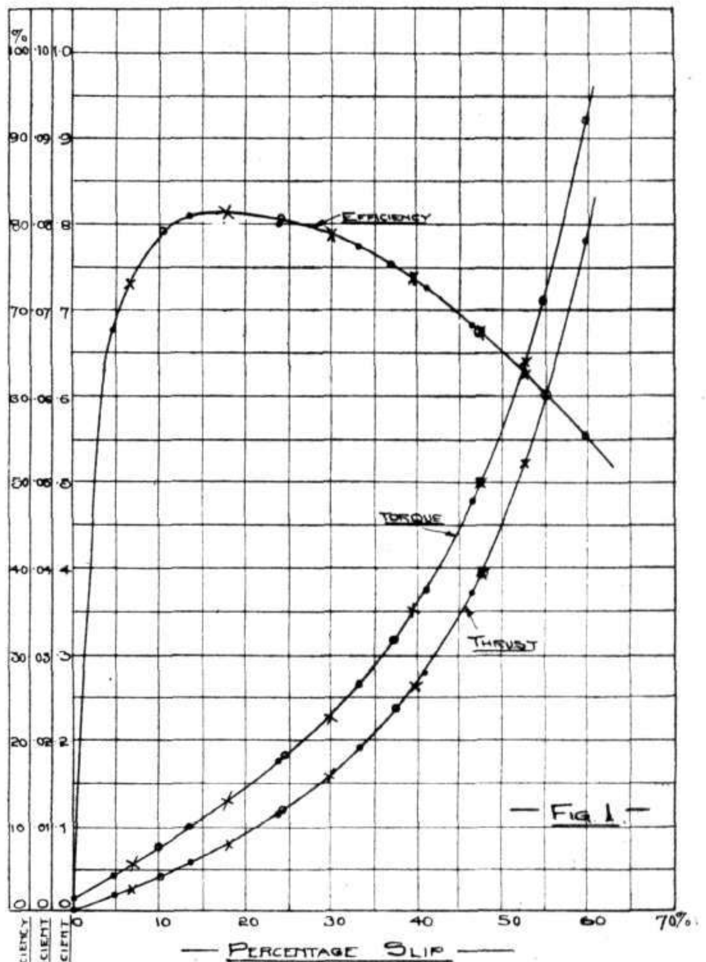
The use of these two non-dimensional numbers or coefficients is so convenient that it is desired to draw special attention to them. As has been pointed out, they are independent of the size and speed of the propeller, and also apply equally well to water and air, so long as the square law holds sufficiently well. They have also another special advantage; that is, being non-dimensional, they have the same values in any system of units, and are thus available for comparing directly the results of tests carried out in any country. The only essential is that the units employed must be consistent among themselves.

For expressing the results of static tests, or tests at a fixed point, where v is zero, two other coefficients are suggested; these are

$$a_0 = \frac{t}{\rho l^4 n^2} \text{ and } b_0 = \frac{q}{\rho l^5 n^2}.$$

Not only are these coefficients non-dimensional, but they are constant for similar propellers of any size and at any speed and in any fluid, so long as the square law holds sufficiently closely.

Evidence of Non-importance to Screw Propellers of Viscosity and Compressibility of Air or Water.—Turning now to the consideration of some of the experimental evidence supporting the view that the effects of the viscosity and compressibility of both water and air may be neglected in so far as they affect the performances of screw propellers, results obtained on similar propellers in water were published by D. W. Taylor in 1906, three sets of five propellers of different



— Fig 1 —

diameters being tested. These are discussed somewhat fully in the Appendix, where it is shown that the differences obtained are only slight, and are probably covered by experimental errors. The range of diameter in these experiments was three to one. Several experimenters have published isolated cases of comparison between two similar propellers working in air. Thus E. Dorand in 1910 gave particulars of tests, with two similar propellers, of 2·5 metres and 4·3 metres in diameter respectively, carried out on a moving carriage, at speeds up to 12·5 metres per second. He showed that the forces on the two propellers varied as the square of the speed and the square of the diameter very closely indeed, for the same value of the ratio $v \div ln$. G. Eiffel in 1911 also showed that this was true to a close approximation, but the precision of his experiments was sufficient to indicate a slight discrepancy in some cases. This discrepancy was chiefly attributable to the distortion of some of the propeller blades at high speeds; and it is interesting that the

* Abstract from a Paper read before the Aeronautical Society of Great Britain at the Royal United Service Institution, Whitehall, S.W., on February 18th, 1914.

results from two propellers of 2·97 ft. and 8·90 ft. diameter agreed almost exactly, when they were tested at the same tip speed, at which the deformations of the two propellers were the same. This can be shown very easily by a further extension of the method of dimensional equations.

In the report of the Advisory Committee for Aeronautics for 1910–11, one comparison was given between the results of tests with a model propeller, two feet in diameter, on the whirling arm at the National Physical Laboratory, and with a similar propeller, 15 ft. in diameter, on Messrs. Vickers' whirling arm. The results showed very good agreement indeed. The speaker himself has not carried out any tests on similar propellers at different diameters, but has tested the same propellers at different speeds, which is exactly equivalent. The results of such tests on a particular propeller are shown in the following figure.

Here the thrust has been divided by $\rho l^2 v^2$ and the torque by $\rho l^3 v^2$. In the figure, curves of these thrust and torque co-efficients and of the efficiency have been plotted against the percentage slip, which is merely a function of the ratio $v \div ln$. The open circles refer to tests at a translational speed of 1,800 feet per minute, the crosses to 2,200 feet per minute, and the black dots to 2,600 feet per minute. It is seen that the points all lie extremely well on one set of curves, which shows that the departure from the square law is extremely small within the range of speed considered. It is admitted that this speed range is only small; but the experiments on this point are so few that every bit of evidence must be considered; and from a consideration of all the evidence available it is felt to be justifiable to say that there is none at present to indicate that any serious errors will be introduced if propellers are assumed to follow the square law exactly. This is especially so, as the difficulties in most propeller tests are so great as to make it very hard to discover experimental errors; and where slight departures from the square law have apparently been discovered, it is generally found that the experimental errors are very likely of the same magnitude at least. Before leaving the consideration of this figure, attention may be drawn to one or two points.

Relation between Efficiency and "Slip."—It is generally found that the higher the maximum efficiency of a propeller the less the value of the slip at which it occurs. This means that with a propeller giving a high maximum efficiency, the thrust corresponding to the conditions of maximum efficiency is so small that advantage cannot be taken of it in an actual aeroplane. From a consideration of the conditions under which the propellers on actual aeroplanes work, it has been found that the usual value of the thrust coefficient lies between 0·15 and 0·20; hence the efficiencies of different propellers should be compared when they are operating between these limits of thrust. The results given in the figure show that this particular propeller is very good in this respect, as the efficiency at a thrust coefficient of 0·18 is still 78 per cent. Another point, which might with advantage be impressed on many would-be inventors, is that for this propeller the maximum efficiency is about 82 per cent.; and there are probably very few aeroplane propellers in use at the present day that do not reach a maximum efficiency of 70 per cent., and an efficiency under working conditions of about 60 per cent. This tends to make one very suspicious of inventions claiming to improve the efficiency of propellers by any considerable percentage.

What is the "Pitch" of a Propeller?—It is now proposed to discuss briefly the question as to what should be taken as the pitch of a propeller; most people have their own views as to the meaning of this term, and this is one of the points on which the speaker expects to have to defend his conclusions against a number of criticisms. Therefore the arguments to show that the value adopted is the most rational one have been given somewhat fully.

If two propellers of the same diameter be tested, no details of the design being known in either case, and it is found that the thrust and efficiency are the same for each, at the same values of translational and rotational speeds; then a rational value of the pitch is defined as that value, which makes the curves of performance of the two propellers identical.

The definition of pitch adopted is that known as either the experimental mean pitch, the conventional pitch or the aerodynamic pitch, which is the advance per revolution of the propeller when it is giving no thrust. Another definition of pitch very largely used is obtained by considering the pressure face of the propeller only. Then if a narrow strip of the blade be considered at a distance, r, from the axis of the propeller and with the chord of the pressure face inclined at an angle ϕ to the plane of the propeller, the pitch of this strip is defined as $2\pi r \tan \phi$, which is the advance of the strip per revolution, when the pressure face only is considered as screwing itself into a solid medium. In most propellers used in aerial work this pitch is different at every radius, and thus a mean value has to be taken to express the pitch of the complete propeller. It is not certain how this mean should be taken, as the efficiency of the blade, from the point of view of thrust producing power, increases with the radius.

Now consider two propellers of the same diameter, with the pitch, as defined in this manner, the same in the two cases. But let one of them have thin blades and the other much thicker blades; then the performances of the two propellers, at the same value of the slip, will be very different in the two cases; and the value of the advance per revolution, to give no thrust, will also be very different.

It is very analogous to the case of two aerofoils for which the rate of increase of lift with angle is the same, but one starts to lift at a less inclination of the chord than the other. This is shown for three aerofoils in Fig. 2, where the lift coefficients, at the same wind speed, are plotted against the inclination of the chord to the wind direction.

If the lifts of these three aerofoils be compared at the same inclination of the chord to the wind direction, their performances are apparently not at all equal. But an inspection of the figure indicates that the performances are very similar, and this is brought out clearly if the curves are plotted against inclinations measured from the position of no lift. This has been done in Fig. 3, from which it is apparent that the behaviour of the three aerofoils is practically the same in the three cases.

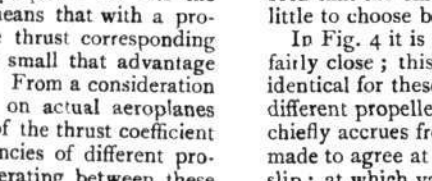
Similar reasoning applies to the case of propellers. In Fig. 4 are shown the efficiency curves obtained for three different propellers plotted against the slip determined by using the mean chord pitch. Here again, from a comparison of the efficiencies of the three propellers at the same value of the slip, there is apparently a large difference between them.

The curves have, however, been replotted in Fig. 5, using the experimental mean pitch to determine the slip; and from these it is seen that the efficiency curves are extremely alike, and there is very little to choose between the three propellers.

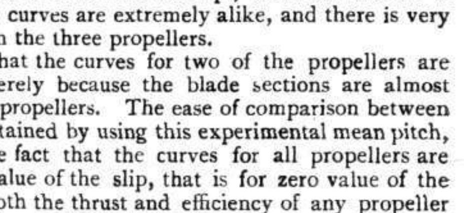
In Fig. 4 it is seen that the curves for two of the propellers are fairly close; this is merely because the blade sections are almost identical for these two propellers. The ease of comparison between different propellers, obtained by using this experimental mean pitch, chiefly accrues from the fact that the curves for all propellers are made to agree at one value of the slip, that is for zero value of the slip; at which value both the thrust and efficiency of any propeller are zero, which is itself an additional advantage.

Having now pointed out some of the advantages of the use of this value of the pitch, it remains to examine the objections that may be taken to it.

It is claimed that, when once the method of calculating the mean of the chord pitches of a propeller at the different radii has been

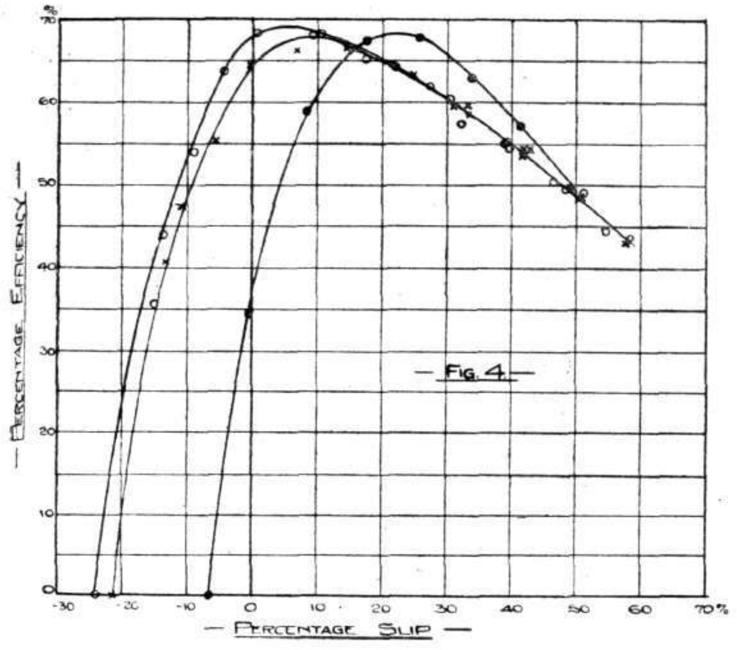


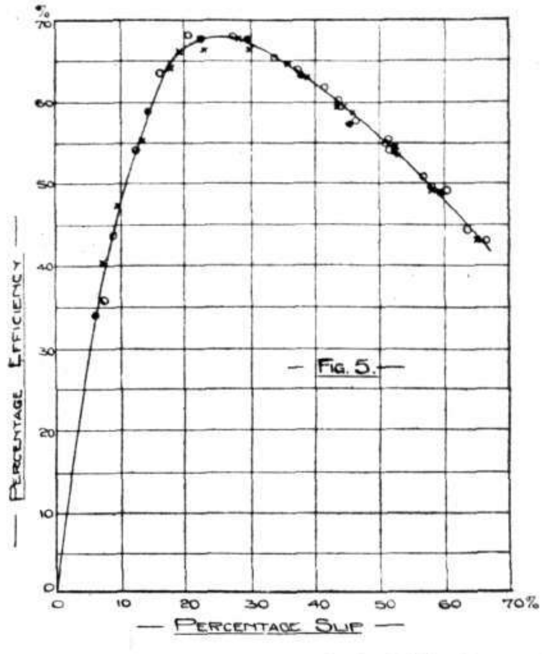
— Fig. 2 —



— Fig. 3 —

determined, this mean chord pitch has one definite value for a given propeller; and it has been urged that the experimental mean pitch varies for a given propeller at different speeds. If this contention be examined theoretically, however, the equation previously given for the thrust $\left[t = \rho l^2 v^2 f\left(\frac{v}{ln}\right) \right]$ shows that the value of the ratio $v \div ln$ which makes the thrust zero at any speed, does so at all





speeds. And, therefore, if the square law assumptions hold with sufficient accuracy, the experimental mean pitch is constant; that is, it is a constant multiple of the diameter, in the same way as the mean chord pitch. Another way of putting the same thing is that the closeness of the experimental mean pitch to a constant value at different speeds is only a further indication of the degree of approximation to which the square law assumptions are true.

In the course of his paper before this Society last year, Mr. Low gave some figures taken from the Bulletin of the Koutchino Laboratory, which only showed a variation of $\pm$ 2·5 per cent. in the value of the experimental mean pitch over a considerable speed range; this variation is probably covered to some extent by experimental errors.

In the course of the propeller experiments carried out at the National Physical Laboratory, it has been found invariably that the experimental mean pitch for a propeller is constant within the limits of experimental accuracy for a speed range of 15 to 50 feet per second. Very little experimental data is available on this particular point, but that which has been quoted indicates that the departure from the square law is very slight under these conditions, and that the experimental mean pitch may be taken as constant for practical purposes.

Another objection advanced is that it is impossible to determine the value of the experimental mean pitch during the course of the design of a propeller. But recent experiments all tend to show that the value obtained by actual test differs very slightly from that obtained by calculation from the no lift lines of the various sections, which are used instead of the pressure face chords to determine a mean value of the pitch for design purposes.

Methods of Propeller Design.—It is well to give a little consideration to the various methods that are in use for designing propellers; these may be divided roughly into two groups. The first of these, which has been used for the design of almost all existing water propellers, is to design from previous experience. When a new propeller is required to work under conditions differing slightly from any previously encountered, a propeller that has actually proved itself to be successful under somewhat similar working conditions is chosen as a model. The new propeller is then designed by making slight alterations from this selected model. This method has proved very successful for marine propeller work, the only limitation in the method being that the variation made between any two successive propellers must, of necessity, be small. It must not be forgotten that there is, at the present time, a big difference between the sciences of marine and aerial propulsion, which difference is merely a question of the relative ages of the two sciences.

No doubt one of the chief reasons for the success of this method, when applied to the design of water propellers, is that the number of different propellers working successfully under various conditions is very large; and it is generally an easy matter to select a propeller that shall serve as a model for slight alterations or variations. But aerial propulsion is not yet in this happy state; the science is so new that there has not been time for sufficient data to accumulate to allow this method of design to be applied with certainty of success.

The Aerofoil Analogy.—The result has been that a new and more powerful method of design has been evolved by aeronautical engineers; this method may be termed the blade element theory. This was first developed by Lanchester and Drzewiecki, but has since been considerably modified by subsequent designers. The method is so well known and was so ably expounded by Mr. Low, in a paper read before this Society last year, that it is only necessary to mention the chief points at present.

The root assumption underlying the theory is that any small element of a propeller blade (cut off by two cylinders, concentric with the shaft) is subject to the same forces as an element of an aerofoil of equal length (cut off by two planes parallel to the wind direction), the resultant velocity of the element and the inclination of the element to the direction of the resultant velocity being the same in the two cases. In the case of the propeller blade element the velocity considered is the resultant of the translational velocity and the peripheral velocity at the radius of the element. It is immediately apparent that this is a very far-reaching assumption, and it is now necessary to investigate to what extent it is justified by the results obtained. This practical test, as to whether the method gives satisfactory results when carefully applied, must always finally decide the application of theories of this kind.

The method, as developed by Drzewiecki and others, goes a little farther than the above assumption. It is shown that the efficiency of a propeller will be a maximum, when every element is inclined at such an angle to the direction of its resultant motion that, if used as an aerofoil, it would give a maximum value for the ratio of lift to drag. Hence it has been usual to assume a sort of mean section for the propeller blade; and from experiments on aerofoils in a wind channel, to determine the inclination of this mean section, such that it will give a maximum value of the ratio of lift to drag.

The propeller is then so designed that, under its working conditions, every element of the blade is inclined at this best angle of attack to its resultant velocity, so that under these conditions the over-all efficiency of the propeller shall be a maximum. The forces on each element can then be determined and the total force on the propeller blade be obtained by integration. In Mr. Lanchester's method the integration is graphical in order that the width of the blade may be varied to fit in with other considerations. Drzewiecki, however, worked out his equations on the assumption of a blade of constant width; and Mr. Low last year showed us the equations with the width of the blade expressed as a function of the radius. The object in both these cases was evidently to obtain expressions for the forces on the elements of the blade that could be integrated without resource to graphical methods.

The speaker would like to put in a plea for a further extension of the method, as one strong objection to the method in its present form is that the section of a large portion of the blade must differ very considerably from the mean section taken; this is necessary from considerations of strength and stiffness. But results of tests on so many aerofoils, of very widely varying sections, have now been published, that it should not be difficult to pick out a series to represent almost any propeller blade at various points along the radius. The resultant force on the blade could then be obtained by graphical integration with a much closer approximation to its actual value than is possible by the method of taking a mean section for the blade. If this source of error be eliminated in this manner, the comparison between the forces obtained on a propeller and those obtained by integration from the results of tests on the appropriate sections in a

wind channel would be a determination of the extent to which the root assumption mentioned is justified by experiment.

The Aerofoil Analogy Tested by Experiment.—In order to test this the speaker carried out a series of experiments last year at the National Physical Laboratory; the detailed account of these experiments will be published very shortly now in the Report of the Advisory Committee for Aeronautics.

The propeller used was two-bladed and two feet in diameter; only one set of blades were used, but these were mounted so that they could be rotated, and the tests were carried out with the blades in four positions. The propeller was very similar in design to the Normale propellers, such as are designed for Messrs. Ratmanoff Frères by Drzewiecki. For the purpose of most of the work, the use of four positions of the blades was equivalent to the use of four distinct propellers, and yet errors in workmanship between the different propellers were eliminated by this means. The mean section of the blades was such that the maximum value of the ratio of lift to drift was obtained with the chord inclined at approximately 4° to the resultant velocity. The propeller was so designed that, at one particular value of the ratio of speed of translation to speed of rotation, the chords of all parts of the blades were moving parallel to their resultant velocities.

Tests were carried out with the blades in this position, and also with the blades rotated successively through 4°, 8° and 12°. Then for the one particular value of the ratio of the speed of translation to speed of rotation, all parts of the blades were moving with their chords inclined at 4°, 8° and 12° respectively to their resultant velocities. Then according to Drzewiecki's equations, the propeller should give its maximum efficiency with the chord of every portion of the blade moving at 4° to its resultant velocity.

From the tests on the four propellers, it was found that one with an extra angle of approximately 9° gave the maximum efficiency; but a consideration of the results showed that, when this propeller was giving its maximum efficiency, the angle of attack of the whole of the outer half of the blade varied by less than one degree from the theoretical value of 4°; and the further work carried out showed that the effect of the blade inside half radius was only a small fraction of that of the outer half. Also the whole difference in the maximum efficiencies of the propellers with the extra angles of 4° and 9° was only 2·5 per cent. Therefore, in this respect, the tests indicated that the agreement was quite reasonably close.

In order to complete the more exact comparison on the lines already suggested, a series of aerofoils were made to exactly the same sections as those employed for the propeller blades. Six sections in all were made and tested, these being taken at every two inches of radius of the propeller. In order to eliminate errors of workmanship as much as possible the same templates were used in the manufacture of the propeller blades and of the aerofoils. Also, to avoid the effects of distortion on the propeller blades, no attempt was made to design the most efficient propeller; but the blades were made sufficiently stiff not to suffer any appreciable distortion during the tests, although a more efficient propeller could have been designed by adopting thinner blades.

As is well known, the aspect ratio of an aerofoil has a very considerable effect on the values of the forces obtained on it at any particular speed, so that it was necessary to make some assumption with regard to the aspect ratio to be adopted for the aerofoils. This was done somewhat arbitrarily by making each aerofoil of the same width as the propeller blade at the appropriate section, and 1 ft. long, that being the length of one propeller blade.

These six aerofoils were then tested in the wind channel, and measurements made of the lift and drag forces for different angles of attack, in a wind of 30 ft. per second. From these figures the forces on the blades were obtained by graphical integration for the four propellers at various values of the slip. Allowance was of course made for the different speeds of the various sections. In making the calculations, reliance was not placed on the designed inclinations and angles of attack of the various sections, but the actual inclinations of the blades at the various radii were accurately measured up, both before and after the tests, and the mean values so obtained were used in the calculations. This eliminated errors due to the warping of the blades, either from the forces on them during the tests or from damp and temperature changes in the atmosphere.

It is not proposed to give here the detailed results of these experiments, but Figs. 6, 7 and 8 have been prepared to show the type of agreement obtained on one particular propeller.

These show the values of the thrust and torque coefficients and the efficiency plotted against the slip. The black dots are the experimental values and the open circles the values obtained by integration. In order to make the comparison correct, the same value of the pitch has been used in determining the slip for both sets of results; for this purpose it is immaterial what particular value is used, so long as it is the same in the two cases, for the conditions are fixed by the ratio of the speed of translation to the speed of rotation, and the pitch is merely a convenient factor in the reduction and presentation of the results.

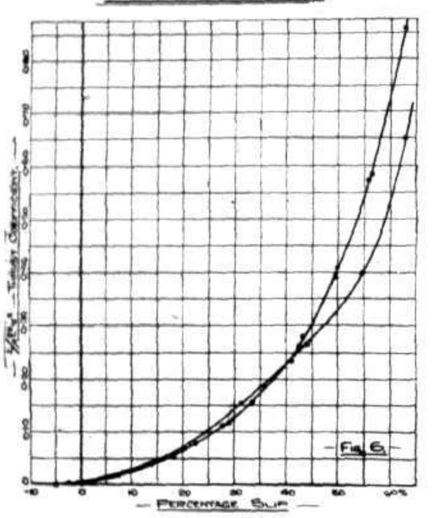
From the curves it is apparent that the agreement is not exact; but as it has been generally stated by several experimenters that Drzewiecki's theory is in good agreement with experimental results, it appears necessary to examine whether such discrepancies as are here apparent would be detected by any method of comparison previously applied. In the first place, it is not necessary to make the comparison over the whole range of slip, as, from consideration of the conditions under which the propellers on actual aeroplanes work, it has been found that the usual value of the thrust coefficient lies between 0·15 and 0·20; this limits the range for comparison very considerably. It is seen that the efficiency discrepancy is chiefly due to the calculated torque being greater than that obtained by experiment. It is believed to be usual for propeller designers to allow in their calculations for these discrepancies by making fixed percentage corrections to the values of the lift and drag coefficients obtained from experiments on aerofoils.

There is one other point that is of interest in this respect which can be best illustrated by means of a concrete example. Suppose the propeller, the results for which are shown in the figures, to have been designed to give a thrust coefficient of 0·164 at a slip of 32·5 per cent., and let the engine speed corresponding to this slip be 1,150 revs. per minute. An inspection of Fig. 6 will show that under these conditions the actual thrust coefficient obtained would only be 0·150. If, however, the engine speed be allowed to run up until the slip is 34·0 per cent., the required thrust coefficient of 0·164 will be obtained. The new engine speed under these circumstances will be

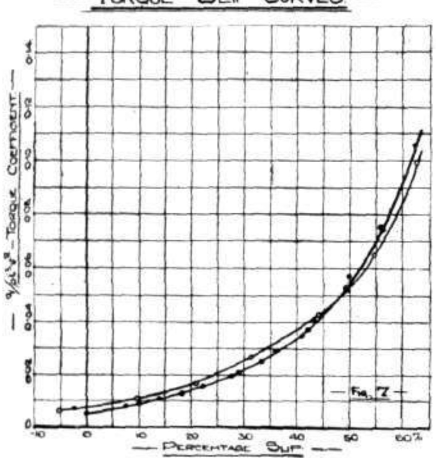
$$1{,}150\left(\frac{1-0\cdot325}{1-0\cdot340}\right) = 1{,}176 \text{ revs. per minute.}$$

In other words, the increase of thrust of 9·3 per cent. has been obtained by an increase in the engine speed of 2·3 per cent. It

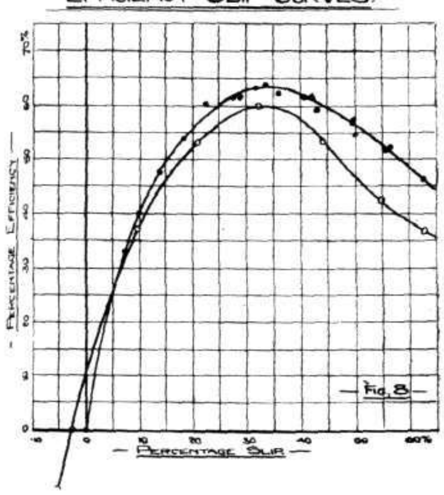
— THRUST-SLIP CURVES —



— TORQUE-SLIP CURVES —



— EFFICIENCY-SLIP CURVES. —



would be easy to suppose that there was very close agreement between the calculated and experimental values under such circumstances, or if the matter be regarded from another point of view the discrepancies between the calculated and observed values are not of great importance, as a small variation in engine speed will bring the thrust coefficient to the required value. If the engine had been designed from the calculated values, it would have to be run with the throttle slightly closed, as the experimental efficiency would be higher than that calculated.

Causes of Discrepancies in Test Results.—It is well to note a few of the most obvious causes of the discrepancies that are observed in these tests. In addition to the question of aspect ratio, which has already been mentioned, the air speed in the channel experiments was only 30 ft. per sec. or 1,800 ft. per min.; whereas the resultant velocities of some of the sections were very high (the tests being carried out at translational speed of 1,800, 2,200, and 2,600 ft. per min., with, of course, much higher values for the peripheral speeds of the blade tips); this may account for some of the reduced efficiencies.

On the other hand, it is more probable that most of the discrepancies are due to the centrifugal forces on the air in contact with the blade; this must alter the character of the flow round the blade very considerably, and it is perhaps a matter for surprise that the agreement between the calculated and experimental values is as close as it is, and not that they do not agree exactly. In the complete account of the tests some further minor comparisons were made; but perhaps enough has now been said to show that, although the method is not strictly correct, yet in the hands of a careful designer it is probably by far the best method that can be used for the design of aerial propellers, in the present state of knowledge.

In the appendix already referred to, the author gives a connected summary of the results obtained in experiments with the screw propeller in water by Froude, Taylor and Durand, and in air by Turnbull, Bejeuhr, Dorand, Riabouchinsky, Eiffel, and at the National Physical Laboratory. The conclusions which may be drawn from Durand's tests in water are given in the experimenter's own words for comparison with the author's summary of the results obtained from the N.P.L experiments in air.

Durand concluded that:—

(A) The general character of the efficiency curve for varying slip, the pitch ratio and area being constant, is well known . . . , such curves . . . indicate a low value of the efficiency for low values of the slip, rising to a maximum in the neighbourhood of 20 to 25 per cent., and then falling off more gradually for increasing values of slip.

(B) In general there is an indication that the propeller of very small area reaches its efficiency at a relatively high slip, usually 25 per cent. or over; while that of large area reaches its best at about 20 per cent. and slightly below.

(C) The highest values seem, furthermore, to be only slightly dependent on either area or pitch ratio; by far the larger number of the propellers under test reaching, at some value of the slip, an efficiency close to 70 per cent., with, in general, the best results for fairly high values of the pitch ratio and moderate areas.

(D) In general, propellers of high pitch ratio reach their best efficiency at a somewhat higher slip than those of low pitch ratio.

(E) For low values of the slip, such as 10 to 15 per cent., and low pitch ratios, increase of area is accompanied first by increase in efficiency and then by some falling off; while for higher values of the pitch ratio and low slip there is a general improvement of the efficiency up to some value at which it remains nearly stationary.

(F) For high values of the slip there is, in general, a continuous though slow decrease in efficiency with area through the range under investigation.

(G) Intermediate between these extremes we find, for moderate values of the slip, but slight change of efficiency with area.

(H) For propellers, lying within the more common ranges of pitch ratio and area, and operating at values of the slip between 20 and 30 per cent., it appears that the efficiency will vary but slightly over the midfield range thus indicated, and that any proportions corresponding to operation within these general limits may be freely chosen without fear of any important drop in efficiency below the limits of 68 or 70 per cent.

The general deductions made from the N.P.L. tests are as follows:—

(A) The efficiency-slip curves are of a similar shape to those found for water propellers; the maximum value of the efficiency occurs at a value of the slip between 20 and 30 per cent.

(B) A propeller of width ratio 0·22 reaches its maximum efficiency at a slip of 25 per cent.; while a similar propeller of width ratio 0·55 reaches its maximum efficiency at a slip ratio of 20 per cent.

(C) In this series of tests the total variation of efficiency is small. The maximum value of the efficiency in all cases lies between the limits of 71 per cent. and 77 per cent., with, in general, the best results for fairly high values of the pitch ratio and moderate areas.

(D) In these tests the slip at which the propellers attain maximum efficiency appears practically independent of the pitch. (Subsequent work shows, however, that, in general, the propellers of higher pitch attain maximum efficiency at a less value of the slip than those of lower pitch.)

(E) At a slip of 20 per cent., and a pitch ratio of 0·675, a width ratio of 0·30 gives an efficiency of 65·8 per cent., and a width ratio of 0·47 gives an efficiency of 69 per cent. (As only two values of blade width were tested at this pitch, it is impossible to say whether this is in agreement with the results on water propellers or not.) At a slip of 20 per cent. and a pitch ratio of 0·80, a width ratio of 0·30 gives an efficiency of 73·9 per cent., and a width ratio of 0·47 gives an efficiency of 70·8 per cent.

(F) No comparison has been made for slips higher that 30 per cent.

(G) The changes of efficiency with area are fairly small at all places.

(H) This statement for water propellers may be paraphrased, in view of the present series of tests in air, as:—A propeller may be designed of any reasonable form, pitch, and area, lying within the range of common practice, without danger of the efficiency falling outside the limits of, say, 65 and 75 per cent., although it may attain to a value of, say, 77 per cent.

[Recently, a considerably higher efficiency than this has been obtained, the value being approximately 82 per cent.]

The author observes that a detailed comparison of the above conclusions with the corresponding conclusions drawn by Durand from the results of his tests in water, shows to what a remarkable degree the same conclusions apply to the results obtained in the two different media; and as a result of a very careful consideration of all the available experimental information on propellers, the following brief summary of general conclusions was drawn up:—

(1) The "square law" assumptions are obeyed very closely indeed by propellers, so that the results of model tests and of tests in water may be applied directly to full-size propellers in air.

(2) The method of design usually adopted for air propellers (*i.e.*, considering the blade as an aerofoil) is sufficiently accurate to give good results in the hands of a careful designer.

(3) The best ratio of blade width to radius of propeller appears to be about 0·30. This figure may require considerable modification, as a remarkably high efficiency has been obtained with a four-bladed propeller, having a blade width ratio of only 0·12.

(4) The ratio of pitch to diameter of propeller to give maximum efficiency appears to be anything between 0·8 and 1·4. This is the value that gives the maximum efficiency, but it will probably be found better to use a propeller of less pitch ratio, as the coarse pitch propellers give their maximum efficiency at such a low value of the slip; so that the thrust corresponding to maximum efficiency is too small to enable advantage to be taken of the maximum efficiency on actual aeroplanes.

(5) The propeller should have narrow blade tips, for most efficient working, and to avoid vibration.

(6) Attention should be paid to the shape of the back of the blade; the section of the blade should be such that, if used as an aerofoil, it would give a high value of the ratio of lift to drag.

The paper concluded with a list of published papers and articles dealing with the subject of screw propellers in water and in air.

A Lecture on Aviation.

ARRANGEMENTS have been made by the Essex Motor Club for a lecture on "Aviation" to be given by Mr. J. H. Ledeboer, in the Associates' Room of the R.A.C. in Pall Mall, S.W., on Thursday next. The meeting will commence at 8 p.m., and the Committee will welcome any visitors who are interested. Special attention will be paid by the lecturer to the subject of wind pressure and the resistance of moving bodies.

The D.F.W. at Farnborough.

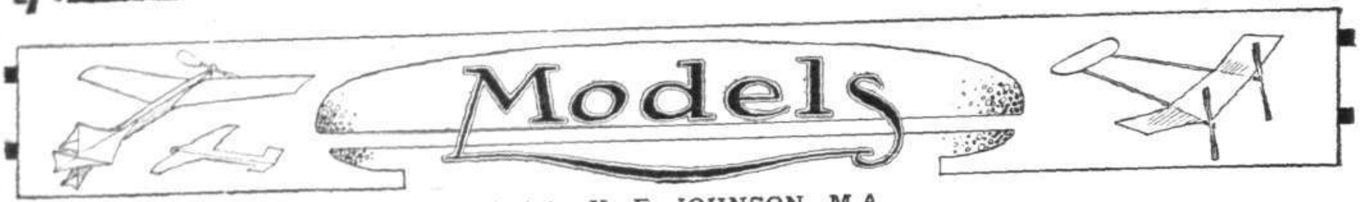
THE D.F.W. machine, which was flown over to Farnborough last week to show off its qualities to the War Office representatives, after having gone through its evolutions, was flown back by Herr Roempler to Brooklands without incident.

Another New Zeppelin Ready.

THE twenty-third Zeppelin airship to be built at the Friedrichshafen works is now ready for her trials. When these have been completed the vessel will be taken over by the military authorities and numbered Z8. She will be temporarily stationed at Treves until the new station which is being built at Dusseldorf is ready.

A New Clement-Bayard Airship.

THE French military airship previously known as the "Clement-Bayard VI," and now re-named "Eugene Montgolfier," paid a visit to Paris on Monday. Leaving Lamotte Breuil at 9 a.m. she passed over Issy two and a quarter hours later, and after circling above Paris, returned to Lamotte Breuil, where she was safely docked at 1.30 p.m.



Edited by V. E. JOHNSON, M.A.

Mr. F. Handley Page's Lecture: The Discussion.

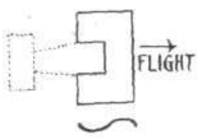
MR. H. H. GROVES asked the lecturer: (1) What was the real cause of failure in full-sized Canard-type machines; (2) Why should there be end losses in a plane (or wing), since the air is sucked in, in the case of a propeller, and a plane is analogous to a propeller with an infinite radius.

Mr. G. P. Bragg-Smith said he quite agreed with the lecturer, and considered that he had set a good example in recognising that the model had a scientific value. In dealing with the discussion, he thought that although he held different views with regard to lateral stability, he was certainly not confined to the idea that there was only one way of obtaining it. As regards experiments with gliders, undoubtedly they were of scientific value; but he thought that experiments with a model fitted with a propeller had a greater value, since such enabled you to take into account the propeller thrust, which was one of the most important factors to be reckoned with in a full-sized machine. Taking the case of an automatically controlled aeroplane, the effect of the propeller if placed in the correct position in the vertical plane, which he considered is such that the centre of pressure, centre of gravity and centre of propeller thrust are in a line, then when the propeller stopped, the machine automatically assumed its gliding angle. He quite agreed with Mr. Handley Page's remarks *re* propeller behind, and he also believed that if the Canard type of machine were fully developed it would prove far superior to the ordinary type of full-sized machine, with its large plane forward. One reason why the propeller is best placed absolutely in the rear is that the propeller draught not coming in contact with any tail planes, did not affect its stability. In conclusion, he was convinced that the model would prove of greater value in aeronautics, if its lessons were properly appreciated than in any other engineering science, and that, had manufacturers paid more attention to it and recognised its merits, they would have saved themselves a considerable amount of trouble and expense.

Mr. F. Mayer: Mr. Handley Page had said that the aim of many designers of stable aeroplanes was the ultimate production of a machine without either front or rear stabilizing planes, with the necessary outrigger or body to support them. The lecturer spoke of having made a step in this direction in his experiments at Hendon, when the *empennage* of the Handley Page biplane was removed. The speaker had also made some experiments with the same idea in view. The main surface of the models experimented with was of the double curve or S section.

Direction of flight.

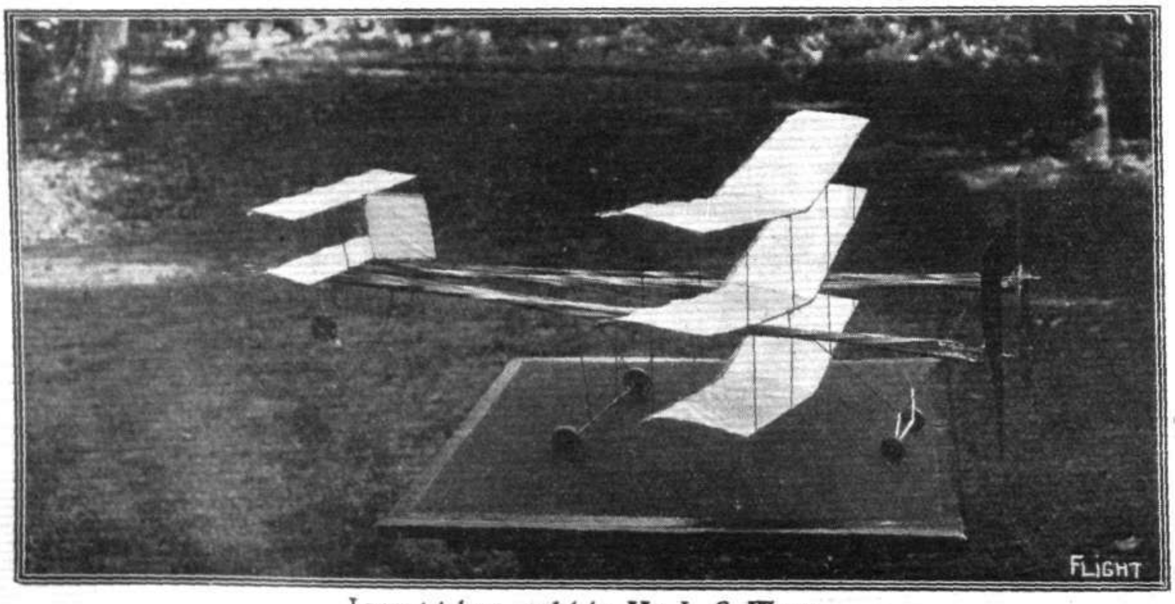
He found that he was able by such means to produce very stable gliders of 3 to 10 ozs. in weight. These gliders were quite a success without the use of either any front or rear elevator or damping surface. The next step was the building of a power-driven model fitted with one of his early petrol motors, which it was hoped would possess the same characteristics. After a few adjustments and experiments the model did actually fly, but so many difficulties were met with that we were forced to take a backward step and fit a tail plane. This had the effect desired—*i.e.*, the resultant model flew well, but the tail plane completely upset the stability of the curve of the main plane, so we removed the turned-up back edges of the main plane, which were really large flaps, and had then left a plane of the ordinary camber. This was found to be an improvement so far as stability was concerned. It seemed as though the sectioned main plane on their own account were very stable, but in conjunction with a tail the stability did not appear to be nearly so good. Referring to the question of weight carried per unit area at a given speed on large and small planes, Mr. Mayer said he had tried two models—one a power-driven one, and the other a model driven by rubber. The rubber-driven model was exactly a quarter the size of the other, and both flew at almost exactly the same speed, which, as near as could be measured, was about 17 miles per hour. The large model carried from 2 to 3 oz. more per square foot than the smaller one. This he partly put down to the fact that the angle of incidence of the rubber model was rather larger than is usual for models of this kind. Both models flew at the same time and in the same attitude. The plan of the surfaces of the S curve model was as per rough sketch.



How Long Ought Rubber to Last?

A correspondent writes as follows: "Could you kindly tell me how long model aeroplane rubber ought to last? I use ¼-inch strip rubber (8 strands), and I have tried several lubricants, but can never get the rubber to last more than a week or two, sometimes the strands burst separately, but several times all eight strands have gone simultaneously, after only being in use a day or two. The rubber used was quite new, and seemed in good condition. My model is 30 ins. long, and I never wind my rubber motor up more than 450 turns. The rubber does not go near the hooks, so these cannot have worn; it generally breaks in the middle. I should much like to know the best way of preserving it and how long it ought to last?"

Your rubber under such circumstances as the above ought to last quite a good time, with care. We can only conclude it is not good rubber. Refuse any and all rubber which when bought will not stretch to *at least* eight times its own length without fracture; in other words you should be able to pull out a piece some 3 ins. long to a length of about 24 ins. I have just performed this actual experiment with some (unused) rubber which I have had for nearly a year (kept in a tin).



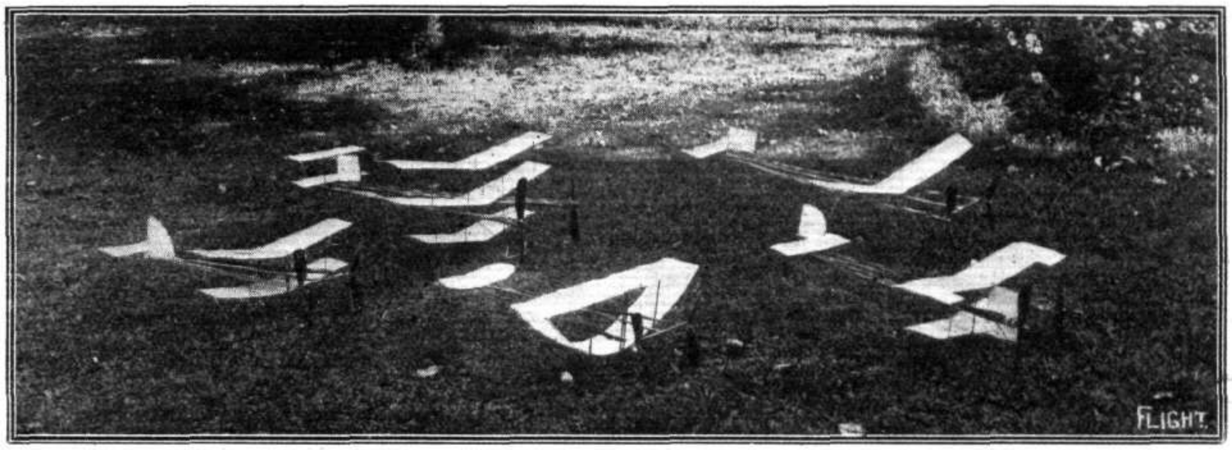
Large triplane model by Mr. L. S. Wyatt.

If your lubricant contains any grease or vaseline, it will, of course, quickly ruin your rubber. Harmless recipes have been given in back numbers. The rubber must be *well* lubricated. After you have been out flying your model, remove the rubber and keep it in an air-tight tin. Never leave it in the sun any longer than you can help. Keep the tin in a *cool* place. Use valve tubing over your rubber and propeller hooks. You get rather better results weight per weight with strip than square-sectioned rubber, but the writer's experience is that the latter is more durable. Don't join your rubber by tying knots in it, but by means of thread. Overlap the two ends for about an inch, get someone to pull or stretch these as far as possible and tie *when stretched.* Trim the ends with a pair of scissors.

A Large Triplane Model.

A correspondent, Mr. L. S. Wyatt, sends us the following interesting particulars of a somewhat uncommon type of model. The model is all steel except the motor rods, which are bamboo. Chief dimensions: Total length 40 ins., span of main plane 30 ins. Chord 4·5 ins. Gap 4 ins. Elevator, span 12 ins., chord 3·25 ins., gap 3 ins. Propellers 10 ins. in diameter and 22-inch pitch. Middle plane set at negative angle; the others at a slight positive angle of incidence. Motors, twin gear of 12 strands of $\frac{1}{4}$-inch strip rubber; centre of gravity 2 ins. in front of the leading edge of the main planes. Average flight 150 yards off the ground. Weight 1 lb. 2 ozs. The model is very stable and flies quite straight.

Mr. Wyatt also sends the following particulars of another triplane constructed by him: Length of fuselage 38 ins., A-frame design, material bamboo. Span of two top planes 30 ins., of the lower 22 ins. Chord 4·75 inches. Double elevator 12·5 by 3·25 ins. The trailing edge of the elevator is mounted on two wire bridges, the front pair of uprights being carried down through slots, for elevation purposes. Diameter of propellers 10 ins., pitch 22 ins., each worked by $\frac{1}{2}$-inch gear wheels. Four strands of $\frac{1}{4}$-inch strip rubber to each wheel, making 16 strands in all. Weight 15 ozs. As in the other model, everything is steel save the motor rods. The wheels are turned from solid blocks of red fibre. Four of them weighing $\frac{1}{4}$ oz. The model rises after a run of about 15 ft. and flies rather low for an average distance of 100 yards. I am fitting floats for trials off the river Ouse. This is my 25th successful motor.



A few of Mr. L. S. Wyatt's models.

Aero Silk for Models.

We have received from Mr. G. P. Bragg-Smith some samples of his latest aero silk fabrics for models. Mr. Smith informs us that Mr. Louch, whose model made the as yet unbeaten records of 2 mins. 49 secs., was covered with this fabric, and that it is also used by Messrs. Slatter, Houlberg, and several other record holders. Personally, the writer has almost invariably used one of these fabrics, and found them perfectly satisfactory in every respect. We certainly know of none better.

Messrs. J. J. Griffin and Son's Catalogue.

The above firm, of Kemble Street, Kingsway, London, send us a copy of one of their catalogues of scientific apparatus. The book, which consists of over 1,000 pp., and an enormous number of illustrations, is entitled "Scientific Handicraft," and deals fully with all kinds of scientific physical apparatus as well as tools. As we have before remarked, the science of aeronautics is so intimately bound up both in theory and practice with the other physical sciences, that a more or less intimate knowledge of other branches besides those of an aerodynamical nature are essential if real progress is to be made. The only real, safe and sure knowledge is that founded on experience, based on experiment. For experiments we must have apparatus either purchased or home made. In the pages of the volume referred to is a veritable mine of information concerning all sorts and kinds of experimental scientific apparatus, which cannot fail to be of the greatest use to anyone carrying out any scientific work, no matter of what kind.

How to Determine the Static Thrust of a Propeller.

A correspondent writes asking the best way to ascertain the above. One of the best is probably the following: Mount the propeller on the shaft of an electric motor, of sufficient power to give the propeller up to 1,500 r.p.m. if of fine pitch. If coarse, say half that number; a suitable accumulator or other source of electrical energy will be required; also a speedometer or speed counter, as well as a voltmeter and ammeter; a stop-watch is also very useful.

Place the motor on a pair of scales or on a suitable spring balance (the former for preference), the axis of the motor vertical, with the propeller attached. Rotate the propeller so that the air current is driven *upwards*. When the correct or desired speed (as indicated by the speedometer and a watch) has been attained notice the difference in the readings if a spring-balance is used, or, if a pair of scales, place weights in the scale pan until the downward thrust of the propeller is exactly balanced. This gives you the thrust in ounces or pounds.

Note carefully the voltage and ampèrage. Let us suppose the former 8 and the latter 10 = 80 watts; remove the propeller and note carefully the number of volts and ampères consumed in running the motor alone; that is, to excite itself and overcome friction and air resistance, suppose this to be 8 volts and 2 ampères = 16; the increased load when the propeller is on is therefore 80 − 16 = 64 watts. All this increased power is not, however, expended on the propeller. The lost power in the motor increases as C^2R, where R is the resistance of the armature and C the current. If we deduct 10 per cent. for this, then the propeller is actually driven by 56 watts. Now 746 watts = 1 h.p. $\therefore \frac{56}{746} = \frac{1}{13}$ h.p. approx. at the observed number of revs. per min.

KITE AND MODEL AEROPLANE ASSOCIATION.

Official Notices.

British Model Records.

Single screw, hand-launched	Duration	D. Driver	85 secs.
Twin screw, do.	Distance	R. Lucas	590 yards.
	Duration	G. Hayden	137 secs.
Single screw, rise off ground	Distance	W. E. Evans	290 yards.
	Duration	W. E. Evans	64 secs.
Twin screw, do.	Distance	L. H. Slatter	365 yards.
	Duration	J. E. Louch	2 mins. 49 secs.
Single-tractor screw, hand-launched	Distance	C. C. Dutton	266 yards.
	Duration	J. E. Louch	91 secs.
Do., off-ground	Distance	C. C. Dutton	190 yards.
	Duration	J. E. Louch	94 secs.
Single screw hydro., off-water	Duration	L. H. Slatter	35 secs.
Single-tractor, do., do.	Duration	C. C. Dutton	29 secs.
Twin screw, do., do.	Duration	L. H. Slatter	60 secs.

Gift of Trophies.—The Council desire to thank the President and his wife (Sir John C. Shelley and Lady Shelley) for their gift of valuable trophies for competition during 1914. Sir John's is for power-driven aeroplanes, and Lady Shelley's is for power-driven hydro-aeroplanes; both trophies are to be won outright, and are not challenge trophies. They will be on show at Olympia.

Kite Section.—The committee of the Kite Section desire to thank Major B. Baden Powell for the gift of a kite winch and cable for use with the No. 1 Section of the Volunteer Kite Squadron.

Wellcome Scientific Expedition.—A letter has been received from the Sudan stating that good kite work has been done by a member of the expedition, and some very interesting photographs, &c. have been obtained. Fuller details will be published, and a lecture given, if possible, on his return to this country This will be interesting news to the Kite Section.

Aero Show.—As a great number of letters have been received on the loading question, the Hon. Secretary wishes to state for the guidance of exhibitors

that the total projected area will count with exception of vertical fins, but Mr. Johnson has kindly consented to deal fully with this in his Model columns.

27, Victory Road, Wimbledon. W. H. AKEHURST, Hon. Sec.

AFFILIATED MODEL CLUBS DIARY.

CLUB reports of chief work done will be published monthly for the future. Secretaries' reports, to be included, must reach the Editor on the last Monday in each month.

Aero-Models Assoc. (N. Branch) (27A, SEDGEMERE AVENUE, EAST FINCHLEY, N.)

FEB. 21ST, flying at Finchley 3 p.m., and Feb. 22nd, 10 a.m.

Leytonstone and District Aero Club (64, LEYSPRING ROAD).

FEB. 22ND, flying Wanstead Flats, 10 a.m. If wet meet at club room. If there are any members who have not sent in their entry forms for Olympia, will they please send same to the Secretary at once, as it is necessary he should apply for sufficient space.

Paddington and Districts (77, SWINDERBY ROAD, WEMBLEY).

FEB. 21ST, flying at Sudbury.

UNAFFILIATED CLUBS.

Edinburgh Aero Club (13, HERMAND TERRACE, EDINBURGH).

IT has come to my notice that several communications which have been addressed to "The Secretary, Edinburgh Aero Club" have not been delivered by the Post Office owing to the above address being a common stair, and it appears to be one of the Post Office regulations that no such communication can be delivered unless addressed to individuals. Will anyone who has had any communications returned please address them to me, John T. Ramsay, Hon. Sec., personally?

Finsbury and District (52, LAMBTON ROAD, HORNSEY RISE, N.).

FEB. 21ST, flying at Finsbury Park (kite ground), 3 p.m. Feb. 28th, competition meeting, commencing 3.30 p.m.

Ilford Model Ae.C. (83, ENDSLEIGH GARDENS, ILFORD).

THE first annual social and dance of the above club will be held at the Kensington Hall, on Wednesday, March 4th, 1914, at 7.30 p.m. sharp. Tickets: Singles, 1s. 6d.; doubles, 2s. 6d. Tickets can be obtained from the Secretary. Feb. 22nd, flying at Newbury Park 10 a.m. (weather permitting).

S. Eastern Model Ae.C. (1, RAILWAY APPROACH, BROCKLEY).

FEB. 21ST, at Woolwich Common, 3 p.m. to 5 p.m.; 22nd, at Blackheath, 8 to 10 a.m.; 22nd, at Lee Aerodrome, 10.15 a.m. to 12.30 p.m.

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CORRESPONDENCE.

Looping the Loop.

[1839] I was very interested in Hamel's performance before the King at Windsor on Monday, February 2nd; but although it was certainly a very thrilling show, it was not quite what I expected. From what I have gleaned from various papers, including FLIGHT, I think I have understood that "looping the loop" was, as seen in

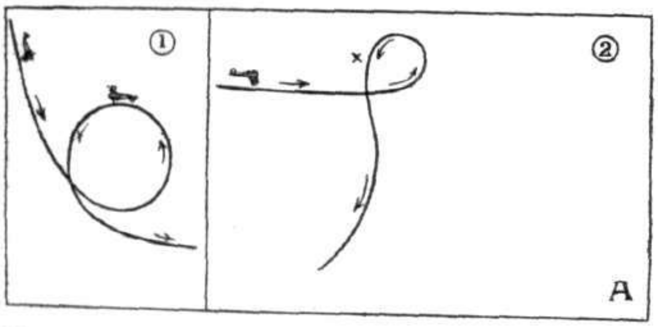

Diagram 1—a steep nose-dive, flattening out, climb, upside down, and another dive. But, as far as I could see, Mr. Hamel did not do the above, but something like what is seen in Diagram 2—no dive, but a sudden climb, upside down, dive and flattening out. To an observer at A, when he reached the point X, the plane was certainly upside down, as could be seen by the white circles. He seemed to fly along quite steadily, then sort of jerked the machine over his head, fell and dived. I should be much obliged if you could enlighten me on this point, and also on one other, namely, why he does not "side-slip" when he banks so steeply.

Windsor, February 10th. "PRESENT ETONIAN."

[Our correspondent's letter re-opens a much debated question. Half-a-dozen experts watching from the ground will each give a different version of what they think really happens, according to the point of view. Even so, there is not much doubt that Mr. Hamel's looping is of a different nature to that of Mr. Hucks. Hucks generally turns the nose of his machine down to gain impetus, and bringing it sharply up, goes over backwards and completes the loop in the same line of flight, coming out of it right way up in his original direction of flight. Hamel, on the other hand, so far as we have been able to see, follows the same evolution as Hucks, till the top of the loop is reached, but instead of continuing right over, comes over on a forward side-slip, later turned into a nose-dive, and regains his right-side-up position at right-angles to his path of flight when climbing, something after the form of a section of a spiral spring. Hucks making six loops in succession under normal conditions, would continue in a straight line of flight; Hamel doing the same would proceed in a circle. Both are magnificent exhibitions, but they are dissimilar. The answer to the second query is that the machine banks at the correct angle according to the speed.—ED.]

The R.A.F. and the Industry.

[1840] If the writer of letter 1838 had read my letter a little more carefully I do not think he would have written to you. I have no very great objection to the Government carrying out experiments, but I do object to a Government Department acting as designer, buyer and seller at one and the same time. It is expecting too much of human nature.

What is good for a business man—who has only his own pockets to consider—is not necessarily good for a country whose interests are far wider. In my own business I may employ foreigners, if it suits my own pocket; but if I am acting in the capacity of an M.P. it is the country's general welfare that must be considered, and not only their immediate pocket.

When I look around me I cannot help but note that the designers of aeroplanes in this country are woefully short. Is it that we have no such brains? Can it be because the country have been content to engage half a dozen men or so at the R.A.F., and given them the control of the money which has been voted by the country for buying aeroplanes? If a healthy outside competition had been encouraged, I am sure we would have had a number of clever designers giving forth their very best for their country. I cannot think that we have cornered in the R.A.F. all the talent that here exists.

February 17th, 1914. OCTOPUS.

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"First-Aid" for Aviators.

MANY little unforeseen accidents befall the aviator, such as a scratch or a barked shin, but until the injury can be properly treated, it is as well to avoid the danger of more serious consequences by adopting prompt antiseptic precautions. Tincture of Iodine is recognised as the best first-aid antiseptic, and it has recently been put up in a most ingenious form by Messrs. Burroughs Wellcome and Co. "Vaporole" Tincture of Iodine is held in a small hermetically-sealed glass container, the point of which is swathed in absorbent material, which, on breaking the point with a sharp tap, becomes saturated and converted into an antiseptic swab, which can at once be applied to the injury. It is sold in two sizes—the 20-drop size, in boxes of six, price 1*s.* 6*d.*; the ½-oz. size, in a wooden protecting tube, price 8*d.*

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PUBLICATION RECEIVED.

Annuario dell' Aeronautica, 1914. Milan: Touring Club Italiano, Via Monte Napoleone, 14.

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NEW COMPANY REGISTERED.

Northern Aircraft Co., Ltd., Saville House, Saville Row, Newcastle-on-Tyne.—Capital £2,000, in 1,900 ordinary shares of £1 each and 800 founders' shares of 2*s.* 6*d.* each.

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Aeronautical Patents Published.

Applied for in 1913.

Published February 19th, 1914.

1,909. N. A. THOMPSON. Constructions for aircraft.
6,592. P. GROSSER. Hydroplanes and flying machines.
6,829. W. B. QUICK AND — TALBOT. Hydro-aeroplanes.
6,869. N. A. THOMPSON. Airships.

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